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The Structure of Manufacturing Production

A Cross-Section View

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(*Resolution of October 25, 1926, revised February 6, 1933*)

The Structure of Manufacturing Production

A Cross-Section View

by Charles A. Bliss

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Preface

THE pages that follow describe a survey of manufacturing operations in the United States in 1929, made from two points of view: (1) the directions of productive effort; (2) the relative use made of different productive factors. Chapter I provides a brief introduction to the study; Chapter II indicates the extent of manufacturing activity in the production of different classes of goods and the distribution of productive resources to these ends; Chapter III discusses the relative magnitude of various elements of cost and the role of capital and labor in manufacturing, again by different classes of goods; Chapter IV provides a summary of the major findings.

Manufacturing includes a fascinating variety of productive activities. In this study, however, these individual processes are merged into composite pictures of groups and subgroups—a procedure that serves to simplify the study of the flow of goods through the manufacturing process. Even so, the basic analysis is by no means simple, for in several of the classifications used a single industry is often represented, with appropriate weights, in more than one grouping. The different classification schemes employed in the study have been chosen chiefly because of their importance in general economic analysis. The purpose of the study is to approximate, for 1929, the extent of activity in the manufacture of

these different types of goods and to summarize the cost relationships that mark such operations. In short it is to give a 'still' photograph of a major segment of the productive economy.

Measures such as those presented depend in part on the area of analysis. Especially is this true of the aggregates of Chapter II. In comparing the results of this and other studies, therefore, differences in definition of manufacturing should not be overlooked. The limits set in this survey are the same as those used by the Bureau of the Census in the 1929 Census of Manufactures. The analysis is built upon the extensive Census data compiled in that year, supplemented where necessary by information from other sources.

Our study bears some relationship, but no close one, to the National Bureau studies of Capital Formation. In these studies Dr. Kuznets has measured the output of manufacturing industries by divisions of products similar to ours, but for the purpose of estimating the volume of flow only. Our survey is less concerned with what leaves the factory doors than it is with what goes on behind them: it is a study of the contribution of manufacturing to the flow of goods that Dr. Kuznets first measures at the manufacturing stage.

The preparation of this report has been furthered at all stages by the help given me by Mildred Uhrbrock, aided at various times by Maude Remey, Gertrude Reaske, Ruby Flanagan, and Louise Nash. Martha Anderson has prepared the manuscript for publication and H. Irving Forman has drawn the charts. Simon Kuznets and William Shaw have made currently available for my use the results of their study of manufacturing records, since published in *Commodity Flow and Capital Formation, Volume I.* Solomon Fabricant and other members of the National Bureau staff have cheerfully advised on the organization of the report, though its patent defects are no fault of theirs. To Wesley C. Mitchell and especially to Frederick C. Mills

are due sincere thanks for encouragement in a project that had its origin in the author's association with Dr. Mills in the National Bureau studies of prices and production. To all these and other participants in the regular work of the National Bureau, as well as to all others who have given aid in various ways, I extend my warm appreciation. Particularly, I wish to thank Dean W. B. Donham of the Harvard University Graduate School of Business Administration for facilitating the completion of the report.

C.A.B.

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The Structure of Manufacturing Production

A Cross-Section View

I

Some Characteristics of Manufacturing

MANUFACTURING comprises the largest single division of the productive system. Through manufacturing industries pass the bulk of the physical goods produced each year. Here occur the chief increases in their value and in their usability. Here, in 1929, originated approximately one-fourth of total national income and here was employed a like percentage of the nation's working force. Along a wide front, men and machines in manufacturing industries are engaged in transforming the shape and character of unfinished goods, making them more useful and better adapted to satisfy human needs.

SCOPE AND METHOD OF THE SURVEY

The manufacturing process may be studied in several ways. For example, changes in manufacturing activity may be indicated by a comparison of output during certain successive periods. This method of analysis usually gives acceptable measures of the varying success of the manufacturing process but tells little about the manufacturing process itself. Nothing is indicated of the relative importance of various types of manufacturing activity, or the relative proportions in which productive resources are employed in the manufacture of different types of goods. Information on such matters is best gained by an examination of various records pertaining to

manufacturing industries for a given period; in other words, by an analysis, not of changes from period to period, but of a cross-section of manufacturing activity.

A cross-section picture of manufacturing is intended to describe manufacturing operations at some given time. Accordingly a cross-section study is essentially descriptive, and in form suggests a 'static' analysis of an admittedly dynamic economy. Artificial in certain respects as such a study must be, it should yield fruitful information. For if our interest lies in the changes that mark the development of an evolving economic system, the first step is their appraisal in the light of the circumstances of some particular time. Every investigator of the changing composition of manufacturing output, for example, or of the changing characteristics of manufacturing operations, must have some benchmark for his findings. In order properly to evaluate his conclusions he must know the relative importance of the various elements that concern him.

In many ways the following study of manufacturing, which is in effect a cross-section study of the sort just discussed, is similar to a survey of the amount and distribution of national income in any year. Each is an attempt to describe, as of a given time, certain aspects of a continuing economic system. Each is informative of the specific historical record of the year to which the data relate. And in varying degrees each throws light on internal relationships of wider interest.

Since any cross-section study must pertain to some one period, its findings will reflect circumstances peculiar to the time of observation—the combination of forces tending to continue relationships of a prior period and forces making for change. Any given year presents an admixture of continuous and transitory elements. Since this admixture is almost certainly of various proportions in the different aspects and relations studied, some of the measures obtained in the survey will vary more from period to period than others.

The significance of a cross-section view of an operating manufacturing system, for periods other than the one studied, is thus dependent upon the relative importance of these continuous and transitory elements, and may be expected to be greater for some portions than for others.

A complete analysis of the continuous and transitory elements present in any set of cross-section observations is impossible without an extensive survey covering a series of years. It has not been the purpose of this study to separate this admixture, or even to indicate the probable degree of year-to-year variation in the different measures presented. Decisions on such questions must await the completion of similar investigations for other years and their analysis in terms of other studies in the general field. The justification of this study rests first on the body of data presented concerning manufacturing operations during an important 'benchmark' year, 1929, on its place in a possible series of similar investigations, and on its examination of certain measurable characteristics of an important segment of the country's productive system.

This survey is not an inventory of various attributes of manufacturing as of a given day. Since it is a study of manufacturing operations, it refers, not to a single point in time, but to a period during which the system has operated. This period might conceivably be a month, a year, a succession of years, or even a decade. Certain advantages might accrue from the selection for study of any one of the intervals suggested. Differential long run changes would have least influence on data relating to a single month, but differing seasonal patterns would limit the comparability of different parts of the total. The use of a period longer than a year would increase the possibility of historical changes affecting the measures, though for certain purposes a long run average might provide measures within which the transitory changes offset one another. Considerable merit attaches, however, to a more restricted period, such as a single year, which has

two advantages—concreteness and a reasonable degree of homogeneity. Since most of the essential data are available only annually (or biennially), the selection of a single year as the period for the survey was clearly indicated.

Chiefly because of the very detailed information available, 1929 was chosen for the study of manufacturing operations. The 1929 Census of Manufactures, being a part of the fifteenth decennial Census, provides particularly extensive and detailed reports. In addition, the Bureau of the Census has issued several special studies relating to manufacturing operations in 1929. There is also available for this year a considerable volume of trade statistics on the consumption of manufacturing commodities that is necessary to the successful conclusion of the study we have attempted. A similar study might readily be made for 1919, using the data of the fourteenth decennial Census. Likewise the reports for 1935 provide information that would make possible another cross-section view of manufacturing operations. But it is doubtful if any year other than 1929 would provide so favorable an opportunity for an initial examination into the characteristics of the manufacturing operations studied.

A cross-section view of manufacturing, such as we plan, gives an insight into what may be called the structure of manufacturing production. In broad terms this 'structure' has been defined as "the productive mechanism of an economy, considered with reference to its organization, the mutual relations among its working parts, and the character of the commodities it is geared to produce".[1] While, because of the presence of the transitory elements discussed earlier, only partial information is provided by a single cross-section view, a step is made toward a more precise delineation of the manufacturing structure by the examination of the 1929 relationships. A series of cross-section studies might go far toward establishing the general magnitudes and the

[1] Frederick C. Mills, On the Changing Structure of Economic Life, in *Economic Essays in Honor of Wesley Clair Mitchell* (Columbia University Press, 1935), p. 364.

variation to which these relationships are subject during business fluctuations. Such studies might also indicate the non-recurring structural changes that are continually modifying what may be termed the persistent characteristics of the productive system.

We have evidence of the changing structure of manufacture in the diverse rates at which industries grow and in the changing character of manufacturing enterprise. We observe the increasing output of durable goods over long periods relative to the output of nondurable goods. We see manifestations of an increasing use of capital in production —extensive capital investments and continued diversion of current production to capital replacement and expansion. There have been remarkable increases in production, in large part the fruition of these capital investments together with new skills of workmen and improved modes and processes of manufacture. Increases in labor productivity have gone hand in hand with this changing structure of manufacturing.

There have also been significant changes in organization. The corporate form has become dominant: in 1929 over 92 per cent of all manufacture was under corporate control. There has been an increasing integration of industry, with ownership forcing its way backward to control primary materials and contributory industries, forward to command distributive channels.[2] Frequently enterprises have spread out to take in competitors or to strengthen quasi-monopoly positions; just as frequently expansion has been into other areas, more or less related to the company's primary activity. There have been shifts in the geographical concentration of industries. In countless ways, persistent forces continually modify the character of the manufacturing structure.[3]

Two major aspects of manufacturing operations are ex-

[2] In 1929 over 26 per cent of the sales of manufacturing concerns not made directly to industrial and other large consumers were made through the manufacturers' own wholesale or retail branches. This was 19 per cent of their total sales (U. S. Bureau of the Census, *Distribution of Sales of Manufacturing Plants*, 1929, p. 26).

[3] For a discussion of various aspects of these changes, see the article by Frederick C. Mills in *Economic Essays in Honor of Wesley Clair Mitchell* previously cited.

amined in this monograph. First we are concerned with the composition of the manufactured product and the distribution of productive resources among different classes of manufactured goods. What types of goods were produced in 1929 and in what proportions were various productive resources employed in their fabrication? Evidence on these points, based on the records of the Bureau of the Census, is presented in Chapter II. The second part of the study concerns the interrelations of productive factors in manufacturing operations. Materials that bear upon this aspect of manufacturing are presented in Chapter III. Comparison is made of the relative importance of different elements of manufacturing cost—materials, wages, and overhead items—and of different productive factors—wage earners, salaried employees, capital. These relationships are examined according to type of product. Do particular groups of industries show different cost patterns? Are there wide variations from industry to industry? What is the relative use made of labor and capital?

The assembly of the material into relevant groups for the purposes of the study has meant an industry-by-industry analysis of products and their appropriate combination according to the particular classification studied. Measures relating to four major classifications are presented, based on: (1) the destination of the ultimate product, (2) the stage of the manufacturing operation, (3) the durability in use of the final product, (4) the source of the major material. Thus we distinguish capital and consumption goods; 'finished' and 'unfinished' goods; durable, semidurable, and transient goods; and products made for the most part from farm, forest, or mineral materials. In addition, various cross-classifications have been made, with the emphasis placed upon the division according to final use.

MEASURABLE ASPECTS OF MANUFACTURING ACTIVITY, 1929

Before examining how productive energies were spent in

1929, we may appraise briefly certain of these resources and various magnitudes descriptive of them. We are restricted to the measurable aspects of manufacturing and for the most part to certain basic data compiled in the Census of Manufactures.[4] It is the division of these data according to different attributes of the manufactured product that will later concern us.

Value of product and elements of cost

Manufacturing operations in 1929, as defined and reported by the Bureau of the Census, were conducted in 210,959 establishments. The total value of the products manufactured, as measured by the sales of these concerns, was $70,435 million. The increase in value at the manufacturing stage as measured by value of product less cost of materials purchased (i.e., value added by manufacture) was $31,885 million. Manufacturers spent $38,550 million in buying raw and semimanufactured goods, including fuels, from other manufacturers or primary producers.[5]

[4] All activities reported in the 1929 Census of Manufactures have been considered within the scope of our survey. Certain borderline activities are thus included. The cutting of lumber and operation of sawmills and the manufacture of cement, lime, and marble and other stone products are included although these are activities closely allied with the production of raw materials, and frequently identified with nonmanufacturing enterprises. Also included is the construction and repair of railroad rolling stock in railroad repair shops, though this is a borderline activity not unlike the servicing and repair of automobiles, which is excluded. Also included is the making of manufactured gas but not the generation of electricity at central power stations, the making of motion pictures but not their projection in theatres. While most manufacturing activities are so classified without difficulty, there are marginal cases in which classification is a matter of arbitrary decision. Since the source of almost all the information about manufacturing that we have used is the Census of Manufactures, we have followed Bureau of Census classifications. These classifications differ somewhat from those adopted by other reporting agencies, for example, the Treasury Department in reporting corporate income accounts and balance sheets, or in other investigations, for example, compilations of national income. Recent estimates of national income compiled by the U.S. Department of Commerce exclude from the manufacturing group the following industries here included: coffee and spices, roasting and grinding; peanuts and other nuts, pressed or shelled; flax and hemp, dressed; dairymen's supplies; manufactured gas; motion pictures; railroad repair shops; ship and boat building (*National Income in the United States, 1929–35*; Washington, 1936; p. 249).

[5] These are the figures reported in the 1929 Census; the minor revisions appearing in later volumes have been ignored.

There is considerable duplication in the gross sales figures since many products are

The value added by manufacture in 1929 represented $11,621 million paid as wages and $3,595 million paid as salaries. The rest, $16,669 million, represented payments for diverse purposes—capital service, taxes, other items of overhead costs, and profits. The various payments by manufacturers reflect contributions by the labor factor, on the one hand, and by the capital and management factors, on the other. The importance of these factors may also be measured directly. This method is particularly useful in the analysis of the capital factor, since the heterogeneous 'overhead plus profits' item, which includes the payments for the use of capital, is an inadequate measure of return on capital investment. Also for many purposes the actual number of persons engaged in manufacturing activity and the extent of their participation is of interest. Accordingly, direct measures of the labor and capital factors have been examined.

Number of wage earners and salaried employees

The average number of wage earners employed in manufacturing in 1929 was 8,839 thousand, the number of salaried workers, 1,359 thousand. Another 208 thousand persons were employed in the administrative offices of manufacturing concerns having central offices. The total number of employees in manufactures was thus some 10.4 million, which represents 30 per cent of employment in all lines of activity.[6]

In the analysis of labor effort in manufacturing operations, account should be taken of varying hours worked by different groups of employees. To supplement the measures of num-

sold to other manufacturers for further fabrication. There is also some small amount of duplication in the value added figures arising from the double counting of contract work. In Ap. IV this duplication is estimated at $352 million.

[6] The basic figures refer to full time employment and exclude entrepreneurs such as independent farmers and storekeepers. The number of employees (full time equivalent) in all activities covered in the estimates of national income in 1929 is 34.7 million; the total number gainfully occupied, including entrepreneurs, was 44.6 million, *National Income, 1929–36* (U.S. Department of Commerce, 1937), p. 20. The number employed in manufacturing given in this report is somewhat less than our figure by reason of the omission of certain industries from the manufactures total (see footnote 4).

ber of wage earners, we have therefore estimated aggregate man hours of employment. Although from a social point of view the individual workman is the unit of greatest interest, aggregate hours of work is the more significant figure in appraising the cost of manufacturing operations and the extent to which physical energies are devoted to these ends. It is estimated that approximately 22 billion man hours were worked by wage earners and some 3 billion man hours by salaried employees in manufacturing enterprises in 1929.[7]

Capital investment

The Census of Manufactures does not report the amount of capital invested in manufacturing establishments. Difficulties of appraisal and especially the problem of apportioning investment among the plants owned by a single concern explain the omission. Estimates of capital invested in manufacturing operations, and in the manufacture of various types of goods, have been prepared from the balance sheets reported to the Bureau of Internal Revenue by corporations engaged principally in manufacturing activities.[8] Such estimates place the extent of fixed capital—plant and equipment less depreciation—utilized in manufacture at $27 billion. This is about 15 per cent less than the total value added by manufacture in 1929. Circulating capital (inventories and cash) amounted to roughly $16 billion.[9] Miscellaneous items of capital assets bring the total to $50 billion. Although these figures are rough estimates, they do furnish measures whose apportionment according to different productive uses indicates the relative importance of capital as a productive factor in manufacturing operations.

[7] See Ap. III for a description of the derivation of these estimates.

[8] The methods followed in estimating these capital values, and the limitations imposed upon them by the inadequacies of the data, are described in Ap. VI.

[9] Accounts receivable have not been included in circulating capital or in the total of all capital because they tend to be offset by accounts payable. From the point of view of the manufacturing structure as a whole it seems desirable to exclude them. For comment on the inclusion of cash see Ap. VI.

Horsepower

The power capacity of primary movers used in manufacturing establishments has also been studied. Despite the varied character of power equipment, the allocation of the 42,931 thousand horsepower capacity reported by manufacturing establishments in 1929 is not without value. There is some evidence that the admitted defects in the horsepower statistics are not serious,[10] although their adequacy as measures of capital use is questionable. However, they serve to supplement the capital estimates and have the distinct merit of being expressed in physical rather than monetary terms.

Keeping in mind the qualifications of the approach, and having considered certain of the magnitudes relating to all manufactures that can be analyzed, we now attempt to find answers to the various questions that have been raised concerning manufacturing activity.

[10] The chief difficulty arises from the lumping into one total of rated capacities of prime movers (steam engines, turbines, water wheels, etc.) and the rated capacity of electric motors run by purchased power. The capacity of electric motors ordinarily exceeds the needed power capacity of the equipment they operate, but the capacity figures for prime movers also overstate the power drawn from them, because of wastage and reserve capacity. These tend to be offsetting factors (in that each element is subject to the same bias) but lead to a general overstatement of power installations. Comparisons between industries in a given year should not be affected as seriously as comparisons over a period of years, in which the increasing dependence on purchased power introduces a baffling trend bias.

The approximate equivalence of the degree of overstatement in the two types of power rating is seen from the following figures. In the *1929 Census of Manufactures* (I, 112) it is estimated that of the total of 20,155,397 horsepower capacity of prime movers, about 11,690,000 horsepower was devoted to the operation of generators furnishing current for the electric motors not run by purchased current, the rest being delivered directly through belts and shafting. The reported capacity of these electric motors run by electricity generated within the plant was 12,376,376 horsepower, a rating not greatly different from that given the corresponding primary movers. Therefore no marked discrepancy seems to arise from the different character of power equipment that is primary from the standpoint of the manufacturing establishment.

For a discussion of limitations on the horsepower statistics of the Census see Horsepower Statistics for Manufactures by W. L. Thorp, *Journal of the American Statistical Association*, December 1929, pp. 376–85.

II

Distribution of Productive Resources among Different Classes of Manufactured Goods

KNOWLEDGE of the utilization of economic resources in manufacturing may be gained by the appropriate classification of data relating to value of product and other measurable aspects of manufacturing operations. In this chapter these data are analyzed according to four major divisions of commodities. The first is based on the ultimate use of the manufactured product for capital or consumption purposes. Relatively heavy emphasis is placed upon this division throughout the study. Three other divisions of the manufactured product are also presented: 'finished' and 'unfinished' manufactured goods; durable and nondurable goods; farm, forest, and mineral products. Certain cross-classifications are also given. The division first discussed is that of capital-consumption goods.

CONSUMPTION GOODS AND CAPITAL GOODS

All manufacturing production, and all productive effort of any sort, is carried on to satisfy human needs, though in many instances the relationship between the good produced and its ultimate human use is not close. In the production of capital goods the path to ultimate consumers' use is indirect, for only as these goods are used by business agencies to increase the flow of consumption goods is their ultimate purpose served. Unfinished materials, also, are not always

clearly associated with consumer uses, although in the final analysis they are ultimately converted into goods for human consumption or contribute their services, as capital goods, to the speeding of the productive process. While from the broadest point of view all production is for consumption purposes, the less inclusive definition of consumption goods will be used in the following discussion.[1]

In measuring the extent of productive activity in the creation of capital and consumption goods two approaches might be used. First, we might consider only those consumption goods turned out by manufacturers in finished form, ready to enter the distributive channels leading to final consumers—in other words, analyze the end-products of manufacturing. The second method (which has been employed in the preparation of this report) is to seek out the industries in which all or a part of the activity is associated with the production of goods destined for human consumption or for capital use and to cumulate the contributions to the creation of the finished product made at each stage. The methods are by no means identical, although changes from period to period revealed by each set of measures should not differ widely. Unfortunately the detail involved in the second method of analysis prevents the easy computation of year-to-year changes, a task made more difficult by the absence of much of the factual information essential to the analysis of

[1] The terms consumption goods and capital goods in this study are identical, as descriptive of broad classes, with the terms consumers' goods and producers' goods used by Simon Kuznets in the National Bureau's studies of capital formation. Dr. Kuznets defines his terms as follows: "*Consumers' Goods*—Commodities and services that, whether finished or unfinished, are, when finished and at their destination, used by household or large ultimate consuming units. Examples: flour, bread, raw wool, clothing. *Producers' Goods*—Commodities and services, whether finished or unfinished, that are, when finished and at their destination, used by business agencies in the process of production. Examples: industrial machinery; steel used therein." (*National Income and Capital Formation, 1919–1935*, National Bureau of Economic Research, 1937), p. 37, footnote.

In part the distinction turns on the ownership, as well as the function, of the goods. Thus materials used to construct a highway have been included with capital (producers') goods, but the automobile, which travels the highway, is considered a consumption good. On the other hand, a Pullman railroad car, which in function is not greatly different from an automobile, is considered a capital good. Obviously there are borderline instances where classification is difficult.

individual industries. However, our present interest lies in the relationships that existed at a particular point in time, not in annual changes.

The view of production afforded by examination of the end-products of manufacturing gives the figures of Table

Table 1

Value of the 'Finished' Products of Manufacturing Industries

Economic Group	Millions of Dollars			Percentage of the Total		
	1919	*1929*	*1933*	*1919*	*1929*	*1933*
Consumption goods	25,773	28,597	14,917	69.6	68.8	79.6
Capital goods (producers' durable goods)	5,641	6,231	1,623	15.3	15.0	8.7
Construction materials	3,705	5,011	1,533	10.0	12.1	8.2
Servicing	1,899	1,705	658	5.1	4.1	3.5
Total	37,018	41,544	18,731	100.0	100.0	100.0

1.[2] The values of the finished products, at the manufacturing stage, are given for 1929, the year chosen as the base point for our survey, and also for an earlier and a later year, 1919 and 1933. These estimates provide a useful background for the measures yielded by the application of the second method, presented in subsequent tables.

The values of the end-products of manufacturing industries include, it should be remembered, payments for the contributions of nonmanufacturing agencies, chiefly those engaged in the production of the raw materials that enter into manufactures. For the most part these materials have come from domestic sources, though some come from foreign

[2] These are estimates of Simon Kuznets, made in conjunction with his study of capital formation (see *Commodity Flow and Capital Formation*, I, 99, 136–8 for annual values, 1919–33). The figures in Table 1 are estimates of the total value, at manufacturers' prices, of finished manufactured goods and construction materials. Construction materials are finished goods so far as manufacturing processes are concerned. Nonmanufactured consumers' goods (fruits, vegetables, dairy and poultry products, fresh fish, coal) are estimated by Dr. Kuznets at $3,279 million; nonmanufactured construction materials at $204 million (*op. cit.*, pp. 128–32, 136, 349).

See Ap. IV for a comparison of these figures and estimates of net value of manufactured products derived in the course of the present investigation.

areas. To the extent that the measures in Table 1 include the value of raw materials of foreign origin, they tend to overstate the value of the product flowing from the domestic productive structure. On the other hand, the values of exported raw materials and semimanufactured goods are excluded from these figures. It has been estimated that the cost of raw and semimanufactured materials of foreign origin used by all manufacturing establishments in 1929 was approximately $4 billion.[3] The value of semimanufactured goods exported in that year we estimate at $0.9 billion (see Appendix Table IVb). The value of exported raw materials was of course much greater, and should not be overlooked in considering the output of both manufacturing and nonmanufacturing operations.

Whereas these estimates of end-products summarize the productive activities of all agencies up to and including the manufacturing stage, the data presented in this report relate to manufacturing industries alone. (In Appendix IV a group-by-group comparison is made of estimates of total value with estimates of the value arising in manufacturing operations alone.) The method followed in our survey has been to examine each manufacturing industry separately, and to allocate the value of product (sales) of manufacturing establishments and the other measurable aspects of manufacturing described in Chapter I to four groups of commodities. The first three groups are similar to, though not identical with, the divisions in Table 1. The first division includes goods destined for human consumption. The products of the food industries, most textile products, portions of other industries, such as lumber or steel, are allocated to this group. At the other end of the classification scheme are the capital goods destined, when fully manufactured, for use by business agencies in the process of production. We have put into a separate group manufactured construction materials, which, although ultimately serving ends not unlike the products in the capital

[3] See *Materials Used in Manufactures: 1929*, U.S. Bureau of the Census.

goods group, are differentiated because of the direct importance, from the consumers' point of view, of residential construction.[4] Finally, there is a miscellaneous group of producers' supplies—nondurable commodities used by producers both inside and outside the manufacturing system for which no adequate accounting by ultimate product could readily be made.[5]

In order to group together all manufacturing operations having a common end, it was necessary to classify, according to the scheme just outlined, the products of the 326 industries recognized in the 1929 Census of Manufactures and to determine the proper percentage of the industry total associated with each division. In some industries there are many products with diverse uses; in others activity is centered on the production of a single commodity, intended for a single market. Industries producing materials of general use such as steel ingots, sulphuric acid, and alcohol presented special problems of allocation. Trade estimates of ultimate markets for various products were used in many instances. Studies by governmental agencies also helped to trace the destination of manufactured goods. However, the uses of certain products, containers, for example, are so widespread and associated with so many other manufacturing processes that accurate division of the total is impossible; for the most part these products have been classed as producers' supplies. The classification of the 326 individual manufacturing industries according to the

[4] When a division between the two major groups is desired for rough comparisons, we have ascribed one-third of construction materials to consumption goods, two-thirds to capital goods.

[5] We recognize three divisions of producers' supplies: (1) producers' fuels, etc., (2) containers, (3) other producers' supplies. The first group includes products that are used to facilitate the productive process; for example, a large portion of the gasoline and fuel oil produced, also that part of coke not consumed in the heating of houses, explosives used for productive purposes, fertilizers, etc. The second group includes tin cans, bags, boxes and crates, wrappings, etc. The third group includes general supplies such as writing paper, ink, stationery, factory and mill supplies of a nondurable character. The 1929 value of products in the first group is $3,218 million, of which $1,017 million is the value added by manufacture. The corresponding figures for the second and third groups are, in millions of dollars, 1,568 and 2,441 of value of products, and 714 and 1,378 of value added, respectively. Analysis of the various products included in the producers' supplies group suggests that 90 per cent ultimately appears in the form of consumption goods, 10 per cent as capital goods.

various divisions just described is shown in Appendix I. Where a fractional allocation to two or more groups was necessary, the percentages used are given.[6]

Table 2 summarizes measures relating to the distribution of productive resources between consumption goods and capital goods manufactured in 1929. The first part of the table gives the value of product and related costs, number of employees, volume of employment, and the capital investment associated with the manufacture of these classes of goods; the second part gives the same figures as percentages of the total for all manufactures.[7] Measures for the more important subdivisions of consumption goods are presented in a later section.

Of the total sales of manufactured goods in 1929, 60 per cent related to goods clearly intended for human consumption. If, by way of rough approximation, we assume that a third of the value of construction materials represents residential building and that 90 per cent of producers' supplies eventuate in consumers' goods or services, the proportion of manufacturing associated with the making of consumption goods is increased to over 70 per cent (72.8).

In similar fashion the other measurable aspects of manufacturing operations can be identified with either capital or consumption goods. Of total value added by manufacture (a more precise measure of manufacturing activity than gross value of product) a smaller amount, 57.5 per cent, is directly associated with consumption goods, and when adjust-

[6] A single set of allocation percentages has been applied to a given industry. Thus, the same set of ratios has been used to allocate the industry's value of product, the various elements of cost, number of wage earners, and other items as well. Usually the basic ratios have been derived from sales data, though occasionally from some other aspect of the industry's product. In the absence of other information it is assumed that the proper ratio in every instance is approximately this common ratio, or that within the aggregate of all industries the departures from the common ratios tend to offset one another. In interpreting the results presented in this chapter, the possible effect of this assumption should not be ignored. In general the result is probably to dull contrasts otherwise more clearly evident. The many instances where industry divisions are not required and variations in the size of the items analyzed help to minimize the effect of a method made necessary by the limited data at hand.

[7] These figures are shown graphically in the series of summary charts in Ch. IV.

Table 2

Value of Product and Measurable Factors of Production classified according to Ultimate Use of Product, 1929

	Consumption Goods	Capital Goods	Construction Materials	Producers' Supplies	All Manufactures
Elements of Value of Product (*millions of dollars*)					
Gross value of product (sales)	42,504	13,920	6,784	7,227	70,435*
Cost of materials	24,162	6,865	3,405	4,118	38,550*
Value added by manufacture	18,342	7,055	3,379	3,109	31,885*
Wages	6,049	3,198	1,361	1,013	11,621*
Salaries	2,045	820	379	351	3,595*
Overhead costs other than salaries, plus profits	10,248	3,037	1,639	1,745	16,669
Number of Employees (*thousands*)					
All employees	5,681	2,437	1,161	919	10,198
Wage earners	4,900	2,132	1,021	786	8,839*
Salaried employees	781	305	140	133	1,359*
Estimated Aggregate Man Hours (*millions*)					
Man hours, total	14,015	6,136	2,917	2,359	25,427
Wage earners	12,087	5,365	2,566	2,019	22,037
Salaried employees	1,928	771	351	340	3,390
Estimated Capital Investment (*millions of dollars*)					
Total capital	27,367	9,761	6,443	6,642	50,213
Fixed capital	13,580	5,403	4,078	3,892	26,953
Circulating capital	9,579	3,374	1,763	1,640	16,356
Horsepower of Primary Movers (*thousands*)					
Horsepower	17,917	10,788	7,789	6,437	42,931*
Elements of Value of Product		Percentage of All Manufactures			
Gross value of product (sales)	60.3	19.8	9.6	10.3	100.0
Cost of materials	62.7	17.8	8.8	10.7	100.0
Value added by manufacture	57.5	22.1	10.6	9.8	100.0
Wages	52.1	27.5	11.7	8.7	100.0
Salaries	56.9	22.8	10.5	9.8	100.0
Overhead costs other than salaries, plus profits	61.5	18.2	9.8	10.5	100.0
Number of Employees					
All employees	55.7	23.9	11.4	9.0	100.0
Wage earners	55.4	24.1	11.6	8.9	100.0
Salaried employees	57.4	22.5	10.3	9.8	100.0
Estimated Aggregate Man Hours					
Man hours, total	55.1	24.1	11.5	9.3	100.0
Wage earners	54.9	24.3	11.6	9.2	100.0
Salaried employees	56.9	22.7	10.4	10.0	100.0
Estimated Capital Investment					
Total capital	54.5	19.5	12.8	13.2	100.0
Fixed capital	50.4	20.1	15.1	14.4	100.0
Circulating capital	58.6	20.6	10.8	10.0	100.0
Horsepower of Primary Movers					
Horsepower	41.7	25.1	18.2	15.0	100.0

* As reported by the Bureau of the Census, *Census of Manufactures, 1929.*

ment is made for the miscellaneous groups the total for all consumption goods is 70 per cent of value added. Apparently from 25 to 30 per cent of manufacturing activity was devoted in 1929 to the creation of capital goods, to be used either for the replacement and extension of existing capital equipment of the economy or for the development of new products and new processes.

One qualification that should be recognized, however, in the discussion of the relative emphasis upon capital construction in manufacturing industries in 1929 is that manufacturers in all industries, regardless of their products, give some attention to the maintenance and development of their capital plant. In some consumption goods industries capital goods may be constructed by members of the plant's working force and installed as operating units. Capital formation of this character, as well as the maintenance of existing capital, escapes detection in our analysis, since we associate such activity in consumer goods industries with the consumption good that it helps to produce. So far as this work is a continued, normal activity it may perhaps be properly identified with the industry's product, but the point should not be ignored in the interpretation of the above data on the distribution of productive resources.

On turning to the analysis of wage payments, we find that over $6 billion was paid in 1929 to wage earners engaged in manufacturing processes resulting ultimately in consumption goods (not including the billion dollars of wages paid for the manufacture of producers' supplies). The making of capital goods accounted for over $3 billion of wages, construction materials a billion and a third. The wages paid in the fabrication of capital goods constituted a significantly higher percentage of total wages (27.5) than either salaries or other overhead expenses in these industries contributed to their respective totals (22.8 and 18.2 per cent respectively). Overhead costs (other than salaries but plus profits) were relatively high in the making of consumption goods (61.5

per cent as against 52.1 per cent for wages). As our analysis of the constituent elements proceeds, some reasons for these differences will appear. For one thing, the heavy wage payments in capital goods industries are found to correspond with fairly high labor requirements. Chapter III traces the differences also to the overhead item and the inclusion of heavy distributive costs, taxes, and other expenses in the factory values of consumption goods.

Employment is measured by aggregate man hours, which is the composite of number of wage earners and estimates of average hours worked (Ap. II and III). While hours worked varied widely, there appears to be little association of a long or short work week with the industry divisions we here recognize; i.e., the differences between the percentages of number of employees and of man hours associated with the several divisions of Table 2 are minor.

If we summarize the figures relating to labor for the capital goods group (exclusive of construction materials) we have the following: wages, 27.5 per cent of the total; number of wage earners, 24.1 per cent; man hours of wage earners, 24.3 per cent; salaries, 22.8 per cent; number of salaried employees, 22.5 per cent; man hours of salaried employees, 22.7 per cent. Since the measures relating to wage earners in the capital goods group are higher than the corresponding percentage of total value added arising from these activities (22.1), we may conclude that, in comparison with the requirements of consumption goods manufacture, the manufacture of capital goods requires a relatively greater labor investment. The figures also suggest that while no greater effort in terms of per capita hours is required, wage earners in capital goods industries receive a relatively greater wage payment. No similar conclusion, however, can be reached concerning salaried employees.

Capital estimates for manufacturing industries based on the returns of over 90,000 corporations[8] place the total

[8] These estimates of capital investment are based on the capital assets appearing on

amount of capital invested in manufacturing at some $50 billion. Almost 55 per cent is directly associated with the fabrication of consumption goods, while indirectly traceable to consumption purposes is most of the additional 13 per cent used in industries making producers' supplies, and approximately a third of a like 13 per cent invested in the making of construction materials. Approximately 70 per cent, therefore, of the capital invested in manufacturing industries is being used to make consumable goods and about 30 per cent to turn out new capital. It would appear that the portion of the capital structure of manufacturing industries devoted to the making of products for consumption purposes is fully as great as the portion of the total labor supply used for the same purpose. Indeed, it is greater if the relatively heavy capital requirements of the producers' supplies group are taken into consideration, for we estimate that most of these supplies are used in making consumption goods.

The capital invested in industries manufacturing capital goods is surprisingly small, relative to the use of other productive factors. Only 19.5 per cent of total capital is represented in these industries, in contrast to 27.5 per cent of all wages. For two items alone, cost of materials and overhead costs, were the ratios lower. It is notable also that this relatively low percentage for capital is not due to the absence of other than fixed capital items. It is rather to be explained by the exceptionally heavy fixed capital requirements in the construction materials (lumber, cement, etc.) and producers' supplies (petroleum refining) industries—in part invested in land and natural resources—and the relatively heavy investment in circulating capital in the consumption goods

the books of record of domestic corporations whose activities are chiefly in the manufacturing field as reported to the Bureau of Internal Revenue. What is here termed fixed capital is the recorded value of lands, buildings, and equipment, less depreciation. Circulating capital includes cash and inventories only, accounts receivable being excluded as a duplicating item since they are largely offset by accounts payable. Total capital includes the above items plus miscellaneous assets such as copyrights, formulas, goodwill, sinking funds, and guaranty deposits. The 1929 value of miscellaneous assets in manufacturing is approximately $7 billion. See Ap. VI for a description of these capital estimates.

group. Fixed capital investment is not relatively heavy in the latter group, for the percentage of the total here represented (50.4) is the lowest ratio for all the items save one, horsepower of primary movers.

Relatively, the power capacity (horsepower) in consumption goods industries is very low (41.7 per cent of all power capacity); it is high for producers' supplies, and highest for construction materials manufacture. In this last named group is found 18.2 per cent of the capacity of all prime movers, although the value added by these industries in 1929 was but 10.6 per cent of the value added by all manufactures. Peculiar circumstances, such as the heavy power requirements of the cement industry, help to explain these concentrations. They provide reasons as well why the horsepower statistics cannot be used to measure the relative capital investment in manufacturing industries. For in general the horsepower statistics, while of interest in themselves, are too much influenced by occasionally heavy industrial requirements and too little representative of advanced technical processes to serve as adequate measures of the use of fixed capital equipment.[9]

Types of consumption goods

The largest of the four groups of ultimate products considered thus far is consumption goods; we proceed now to examine the various types of product within this aggregate.[10]

[9] The residual item, 'value added less wages and salaries', will not serve as a measure of the relative capital investment, although this aggregate includes the service charge on the investment in the form of rent, interest payments, and dividends. The uncertainty and erratic behavior of the profit element plus many payments unrelated to capital needs, such as taxes and distributive expenses, make the total an unreliable measure of capital investment. In the next chapter some of the constituent elements of this residual are examined. We have already commented on the relatively large part of this aggregate for all industries that is associated with the making of consumption goods. If this measure were to be used as a criterion of investment, the effect would be to overstate capital investment in consumption goods industries and to understate capital, by increasing amounts, in the capital goods, producers' supplies, and construction materials groups.

[10] Because there is no means by which the totals for producers' supplies can be allocated to these several divisions of consumption goods, that portion of such supplies as properly should be included with consumption goods has been ignored. Probably most of the containers included in this miscellaneous group are associated with the

Table 3

Elements in the Manufacture of Goods destined for Human Consumption,[1] 1929

	Foods	Wearing Apparel, etc.	House-hold Goods	Transportation		Publi-cations	Fuel (mfd.)	Other Consump-tion Goods [2]	Total Consump-tion Goods
				Motor Cars	Supplies and Other				
Elements of Value of Product (*millions of dollars*)									
Gross value of product (sales)	12,803	11,395	5,416	6,429	1,884	2,752	677	1,053	42,504
Cost of materials	8,779	6,167	2,592	3,870	1,272	781	351	350	24,162
Value added by manufacture	4,119	5,228	2,824	2,559	612	1,971	326	703	18,342
Wages	977	2,111	1,080	979	188	493	64	157	6,049
Salaries	328	542	336	208	50	416	36	129	2,045
Overhead costs other than salaries, plus profits	2,814	2,575	1,408	1,372	374	1,062	226	417	10,248
Number of Employees (*thousands*)									
All employees	997	2,144	1,005	713	142	464	63	153	5,681
Wage earners	857	1,953	879	639	122	288	44	118	4,900
Salaried employees	140	191	126	74	20	176	19	35	781
Aggregate Man Hours (*millions*)									
Man hours, total	2,568	5,158	2,515	1,764	344	1,130	166	371	14,015
Wage earners	2,208	4,698	2,202	1,581	294	702	115	288	12,087
Salaried employees	360	460	313	183	50	428	51	83	1,928
Capital Investment (*millions of dollars*)									
Total capital	7,235	6,755	4,062	3,418	2,026	1,879	794	1,198	27,367
Fixed capital	3,652	3,016	2,078	1,801	1,240	940	373	480	13,580
Circulating capital	2,434	2,896	1,467	1,317	529	374	192	370	9,579
Horsepower of Primary Movers (*thousands*)									
Horsepower	4,219	4,036	3,304	3,317	786	1,349	573	333	17,917

	Percentage of All Consumption Goods[3]								
Elements of Value of Product									
Gross value of product (sales)	30.4	26.8	12.7	15.1	4.4	6.5	1.6	2.5	100.0
Cost of materials	36.4	25.5	10.7	16.0	5.2	3.2	1.5	1.5	100.0
Value added by manufacture	22.5	28.5	15.4	13.9	3.3	10.7	1.8	3.9	100.0
Wages	16.2	34.9	17.8	16.2	3.1	8.1	1.1	2.6	100.0
Salaries	16.0	26.5	16.4	10.2	2.5	20.3	1.8	6.3	100.0
Overhead costs other than salaries, plus profits	27.5	25.1	13.7	13.4	3.7	10.4	2.2	4.0	100.0
Number of Employees									
All employees	17.5	37.7	17.7	12.6	2.5	8.2	1.1	2.7	100.0
Wage earners	17.5	39.9	17.9	13.0	2.5	5.9	0.9	2.4	100.0
Salaried employees	17.9	24.5	16.1	9.5	2.6	22.5	2.5	4.4	100.0
Aggregate Man Hours									
Man hours, total	18.3	36.8	17.9	12.6	2.5	8.1	1.2	2.6	100.0
Wage earners	18.3	38.9	18.2	13.1	2.4	5.8	0.9	2.4	100.0
Salaried employees	18.7	23.8	16.3	9.5	2.6	22.2	2.6	4.3	100.0
Capital Investment									
Total capital	26.4	24.7	14.8	12.5	7.4	6.9	2.9	4.4	100.0
Fixed capital	26.9	22.2	15.3	13.3	9.1	6.9	2.8	3.5	100.0
Circulating capital	25.4	30.2	15.3	13.8	5.5	3.9	2.0	3.9	100.0
Horsepower of Primary Movers									
Horsepower	23.6	22.5	18.5	18.5	4.3	7.5	3.2	1.9	100.0

[1] Both finished and unfinished goods are included in the aggregates here presented. Thus the entries for motor vehicles represent activity not only in the automobile industry but also in industries making upholstery cloth, lumber, and steel. Publications cover both printing and the preceding operations such as ink and paper making. So it is in all groups. For a detailed description of the groups it is necessary to examine the industry classification of Ap. I.

[2] Drugs, medicines, sundries, and recreation goods.

[3] For total consumption goods as a percentage of all manufactures, see Table 2.

Gross value of products and the other items in Table 2 are allocated according to the eight subgroups of consumption goods in Table 3.

The subdivision of the major group consumption goods provides us with additional information, useful for an understanding of the peculiarities of the aggregate. The food industries comprise the group with largest value of product. Cost of materials is an unusually large item in these industries, but even measured in terms of value added the food group accounts for nearly one-fourth of the total for all consumption goods. On this criterion, however, an even greater percentage (28.5) arises in the making of clothing and other personal goods. Domestic transportation including supplies contributes 17 per cent to the total of all consumption goods; the fabrication of household goods adds 15 per cent. In order of importance in manufacturing the groups thus read: personal goods, foods, transportation, household goods, publications, fuels. But this is the order in terms of their rank by value added alone. Other criteria suggest different rankings.

In terms of wage payments, for example, notable shifts in distribution occur from the ranking based on value added. The group of wearing apparel and allied products remains the most important, but the food industries drop in importance. Wage payments in the food industries account for no more than 16.2 per cent of total wage payments in all consumption goods industries, which is the same percentage as automobiles and less than that for household goods. When we turn to salary payments, the figure for the clothing group falls to more nearly the average figure for other items; the spectacular gain that offsets this decline is in publications,

food industries; the other supplies are more generally distributed. We have previously estimated that one-third of the construction materials were used in residential building.

Unfortunately, subdivision of the capital goods group is not feasible. There is little possibility of tracing the various important raw materials, for example steel, to their final capital products; it is even difficult to approximate the division of resources involved in the final manufacturing stage among the various capital goods. Most machinery is reported by the Census of Manufactures under one great industrial grouping: Foundries and machine shops.

where the value added percentage is almost doubled. Of course, it is well known that a large proportion of the employees of the publishing industries are on a salary basis. But it is no less striking to find that 22.5 per cent of all salaried employees of consumption goods industries are associated with this relatively small group in contrast to 6.5 per cent of value of product, or 10.7 per cent of value added. Before leaving this item, it is of interest to observe that in industries producing motor vehicles the number of salaried employees is notably low.

Still further changes in distribution occur when the aggregate capital for the consumption goods industries is divided among these subgroups. Although fixed capital in the consumption goods industries is relatively small (50.4 per cent of the total against 57.5 per cent of value added) over a fourth is in food processing industries. Wearing apparel, household goods, and motor vehicles follow in order. But when the estimates of circulating capital for the same subgroups are examined, the clothing group is well to the fore with 30.2 per cent of the total allocated to consumption goods. The increase is not enough, however, to displace the food industries from the first rank for all capital combined. The same group leads in the use of power equipment, though the amount used is not disproportionate to the value added by these food industries. Relative to the distribution of the value added total among these groups it is in the household goods, motor vehicles, and manufactured foods groups that the greatest horsepower is utilized. In the wearing apparel and other personal goods industries (chiefly textiles) the proportionate power investment is small. There, as would be supposed, it is the wage earner who is the major contributor to the finished product.

We have thus far discussed the distribution of productive resources used in manufacturing among the classes of consumption and capital goods as reflected in the various measurable aspects of manufacturing operations. We identified the

output of every manufacturing industry with the use to which the products would ultimately be put. The next sections continue this analysis of ultimate use, presenting it against the background of certain other classifications we now proceed to explore. The first of these new groupings classifies manufactured goods according to the stage of manufacturing activity; the second, according to durability in use of the manufactured product; the third, according to the source of the basic raw materials.

FINISHED AND UNFINISHED GOODS

In introducing the preceding section on capital and consumption goods, certain estimates of the value of the end-products of manufacturing industries were given (Table 1). Being the final products of the manufacturing process, these goods are of particular significance for the consuming group at large. In business cycle theory the relative volume of fully manufactured consumers' goods (or, as we term them, finished consumption goods) plays an important role. The present figures throw light on these final manufacturing processes. Equally important, they indicate the extent of resources consumed in intermediate manufacturing activities.

Manufacturing processes are not readily classified by stage of fabrication. We have considered as 'finished' the products of the last manufacturing enterprise to handle a particular good prior to its entering the hands of the distributing agent for the ultimate consumer or capital user. At least the goods are finished so far as the manufacturer is concerned. In general this means that while the value of these goods will increase before reaching the consumer, their form will not be altered. There are exceptions to this rule, notably in the construction industry, where changes in form occur beyond the manufacturing process. Our procedure has been to group with finished products those construction materials that do not reappear in the products of other manufacturing industries. The tables are given in sufficient detail, however, to

make possible the ready exclusion of construction materials from the finished goods total, should any reader so desire.[11]

From the viewpoint of the productive process as a whole, only goods destined for human consumption are properly defined as 'finished'. While our immediate distinction includes some capital goods among finished goods, subclassification makes possible their separation. We have therefore four major groups of manufactured commodities: (a) finished consumption goods; (b) finished capital goods (including all 'finished' construction materials regardless of ultimate use in residential building); (c) unfinished consumption goods; (d) unfinished goods destined to become finished capital equipment (or final stage construction materials). The first of these groups is the familiar classification 'consumers' goods'; the other three comprise the group usually defined as producers' goods.

Although we set up the classes of finished and unfinished manufactured goods, we cannot with full assurance interpret the industry data as representing a particular stage in manufacturing activity. The value of these 'finished' goods is the value of the end-products of manufacturing—at cost to the consumers and agencies once removed from manufacturers. But, though relating to end-products, these values need not represent the terminal stages of manufacturing processes as such, for they may well include activities that under other circumstances would be considered preliminary to a final manufacturing stage. In the making of rubber tires, for example, a succession of processes carries forward the basic materials, chiefly crude rubber and twisted cotton cords, to the

[11] In general, decisions whether particular products are to be termed finished (so far as manufacturing is concerned) have paralleled similar decisions made in the National Bureau's capital formation study. Unlike that study, however, this investigation considers within its purview the character of manufacturing processes whose products are termed 'unfinished'. A further distinction is that this study has made the 'industry' rather than the 'commodity' the unit, in order to use the various industry statistics, though industry divisions, wherever they seem necessary, are based upon value figures for the product. Certain of the discrepancies between the capital formation figures and those presented here arise from this fact; differences in definition and scope account for the rest.

finished product—pneumatic tires—all within the same industry. Some of the wage earners in the rubber tire industry are engaged in activities on a level with workers in cotton goods factories or steel rolling mills. In the case of rubber tires, we associate all the workers with a finished good; in the other instances cited the wage earner's product is for the most part unfinished. However, when an industry sees the goods it makes in shape for final consumption there is a measure of unity in the entire process. Each step is articu-

Table 4

Finished and Unfinished Goods in Manufacturing Production, 1929

(the unit is $1 million, except as indicated)

	Unfinished Goods	Finished Goods	Finished as a Percentage of All Manufactures
Value of product*	21,930	48,505	68.9
Cost of materials	12,616	25,934	67.3
Value added by manufacture	9,314	22,571	70.8
Wages	3,805	7,816	67.3
Salaries	961	2,634	73.3
Overhead costs other than salaries, plus profits	4,548	12,121	72.7
Wage earners (thousands)	2,894	5,945	67.3
Salaried employees (thousands)	344	1,015	74.7
Horsepower of primary movers (thousands)	19,675	23,257	54.2

* The total value of product (sales) of all finished products exceeds by a considerable margin a similar total based on data from Dr. Kuznets' study of capital formation (cf. Table 1). The discrepancy is explained chiefly by differences of definition. For example, the present estimates include manufactured gas, motion pictures, producers' supplies such as business stationery, and gasoline, and also the full value of publications, including receipts for advertising. In Dr. Kuznets' study an effort was made to exclude all producers' supplies that would appear in the distributive mark-up at later stages of production. In addition, we have used the 'industry' rather than the 'commodity' tables of the Census and have therefore included some items omitted by Dr. Kuznets. In general the estimates differ as they do because they are designed to serve different purposes. Ap. IV discusses some of the reasons for the difference.

lated with the next in a technological order; there is no recourse to exchange in the public market. The demand for the product of all workers is direct and no part of it is derived through a secondary industrial process. To this extent the distinction we make is real from the point of view of the manufacturing structure.[12]

Subject to the qualifications on definition of finished and unfinished products noted above, we have in Table 4 the division into these two groups of the elements of value of product, the number of employees, and the horsepower of primary equipment in manufacturing industries in 1929.

Approximately 70 per cent of manufactured products are in final form, or at least are at the final manufactured stage. The percentage varies somewhat, but of all value added by manufacture, 29.2 per cent relates to unfinished commodities, 70.8 per cent to what we term finished goods. The percentage is higher for salaries and overhead, lower for wages and number of wage earners. It is lowest for horsepower, since only 54 per cent of the total horsepower in manufactures is in the finished goods industries. It is in the earlier stages of manufacture that the application of power is so important.[13]

The manner in which the items of Table 4 are distributed according to stage of output varies with the type of product. We learn, therefore, more about finished and unfinished goods if we study them against the divisions of ultimate use already established (Table 5). That we learn more, in turn, about these capital-consumption goods is a double gain. For

[12] Much integration of industrial activity is accomplished, however, by the common ownership of establishments in different industries. Where this occurs the industries we list as at the 'unfinished' stage are somewhat closer to their final market than their classification as unfinished suggests. On the other hand, there is some intra-industry transfer of manufactured products, much of it relating to what we have termed finished products. The total amount paid for contract work was not reported in 1929, but was $601 million in 1925, the last year the data were compiled (p. 1301 of *Census of Manufactures, 1925*). In addition, the purchase and resale of merchandise swells the Census totals; it was estimated that all such sales were $534 million in 1929 (*Distribution of Sales of Manufacturing Plants*, 1929, p. 52).

[13] For example, in the iron and steel, pulp and paper, cotton goods, and lumber industries, power equipment in 1929 was rated at 14.8 million horsepower. This is 34 per cent of all horsepower used in manufacturing, though these industries contributed but 11.2 per cent of all value added.

Table 5

Value of Product and other Items relating to Manufacturing Production, 1929

Divided according to Stage of Production and Ultimate Use of Product

Stage of Production and Ultimate Use	Gross Value of Product	Cost of Materials	Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits	Number of Wage Earners	Number of Salaried Workers	Horse-power
			(millions of dollars)				*(thousands)*		
Division of All Manufactures									
Unfinished goods	21,930	12,616	9,314	3,805	961	4,548	2,894	344	19,675
Consumption goods	10,976	6,472	4,504	1,870	466	2,168	1,515	163	8,369
Capital goods	6,552	3,719	2,833	1,211	296	1,326	824	105	6,581
Construction materials	1,511	778	733	319	59	355	241	23	2,150
Producers' supplies	2,891	1,647	1,244	405	140	699	314	53	2,575
Finished goods	48,505	25,934	22,571	7,816	2,634	12,121	5,945	1,015	23,257
Consumption goods	31,528	17,690	13,838	4,180	1,579	8,079	3,385	617	9,549
Capital goods	7,368	3,146	4,222	1,987	524	1,711	1,308	201	4,207
Construction materials	5,273	2,627	2,646	1,041	320	1,285	780	117	5,639
Producers' supplies	4,336	2,471	1,865	608	211	1,046	472	80	3,862
Division of Consumption Goods									
Unfinished consumption goods	1,323	1,043	280	57	27	196	47	11	731
Foods	3,961	2,322	1,639	699	163	777	641	54	2,349
Wearing apparel, etc.	1,600	871	729	306	77	346	282	28	1,602
Household goods	3,287	1,886	1,401	626	133	642	422	49	2,684
Transportation	751	321	430	175	64	191	117	20	964
Publications	54	29	25	7	2	16	6	1	39
Other									

Finished consumption goods									
Foods	11,575	7,736	3,839	920	301	2,618	810	128	3,488
Wearing apparel, etc.	7,434	3,845	3,589	1,413	378	1,798	1,312	137	1,687
Household goods	3,816	1,722	2,094	773	259	1,062	597	98	1,703
Transportation	5,025	3,255	1,770	541	126	1,103	339	46	1,419
Publications	2,001	460	1,541	319	352	870	171	155	385
Other	1,677	672	1,005	214	163	628	156	53	867
Percentage of Unfinished or Finished Manufactures									
Unfinished goods	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Consumption goods	50.0	51.3	48.4	49.2	48.5	47.7	52.4	47.4	42.5
Capital goods	29.9	29.5	30.4	31.8	30.8	29.1	28.5	30.5	33.5
Construction materials	6.9	6.2	7.9	8.4	6.1	7.8	8.3	6.7	10.9
Producers' supplies	13.2	13.0	13.3	10.6	14.6	15.4	10.8	15.4	13.1
Finished goods	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Consumption goods	65.0	68.2	61.3	53.5	60.0	66.7	57.0	60.8	41.1
Capital goods	15.2	12.1	18.7	25.4	19.9	14.1	22.0	19.8	18.1
Construction materials	10.9	10.2	11.7	13.3	12.1	10.6	13.1	11.5	24.2
Producers' supplies	8.9	9.5	8.3	7.8	8.0	8.6	7.9	7.9	16.6
Percentage of Unfinished or Finished Consumption Goods									
Unfinished consumption goods	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Foods	12.1	16.1	6.2	3.0	5.8	9.0	3.1	6.7	8.7
Wearing apparel, etc.	36.1	35.9	36.4	37.4	35.0	35.8	42.3	33.1	28.1
Household goods	14.6	13.5	16.2	16.4	16.5	16.0	18.6	17.2	19.1
Transportation	29.9	29.1	31.1	33.5	28.6	29.7	27.9	30.1	32.1
Publications	6.8	5.0	9.5	9.3	13.7	8.8	7.7	12.3	11.5
Other	0.5	0.4	0.6	0.4	0.4	0.7	0.4	0.6	0.5
Finished consumption goods	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Foods	36.7	43.7	27.8	22.0	19.1	32.4	23.9	20.7	36.5
Wearing apparel, etc.	23.6	21.8	25.9	33.8	23.9	22.3	38.8	22.2	17.7
Household goods	12.1	9.7	15.1	18.5	16.4	13.1	17.6	15.9	17.8
Transportation	15.9	18.4	12.8	13.0	8.0	13.6	10.0	7.5	14.9
Publications	6.4	2.6	11.1	7.6	22.3	10.8	5.1	25.1	4.0
Other	5.3	3.8	7.3	5.1	10.3	7.8	4.6	8.6	9.1

purposes of presentation it has been deemed advisable to consolidate the measures into a single table, in order that comparisons for all groups can be most easily made.

Capital goods comprise a greater percentage of the unfinished goods group than they do of the finished goods group; the opposite is true for consumption goods. The significance of this relationship probably rests in the low unfinished total for consumption goods, and the explanation, or at least part of the explanation, is that few of the manufactured food products change hands at the unfinished manufacturing stage. Chief of the unfinished consumption goods are wearing apparel and transportation equipment and supplies, groups where the method of manufacture requires a succession of production processes. There is some variation in the extent of the unfinished area in the manufacture of construction materials and producers' supplies. On the whole, a relatively small percentage of total construction goods are called unfinished, but a relatively large percentage of producers' supplies are so termed.

Careful scrutiny of the various measures reveals interesting differences. For example, the amounts paid as wages in industries making finished capital goods (25.4 per cent of the total for all finished goods) is markedly higher than the corresponding percentage for value added (18.7) or overhead plus profits (14.1). But when we examine the same ratios for the unfinished capital goods, the differences are by no means as marked: 31.8 per cent for wages as against 30.4 for value added and 29.1 for overhead. (Of course it is the relative size of these ratios that concerns us here; their magnitude was commented upon in the preceding paragraph.) The counterpart of these relationships is the low percentage of wages for finished consumption goods, the high figure for overhead.

Table 5 shows the divisions of the finished-unfinished groups according to the capital-consumption goods division. Table 6 reverses this procedure and indicates the finished

Table 6

Relative Importance of Finished Manufactures, 1929, Classifications based on Ultimate Use of Product

Finished as a Percentage of Finished plus Unfinished

Ultimate Use	Gross Value of Product	Cost of Materials	Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits	Number of Wage Earners	Number of Salaried Employees	Horse-power
Divisions of All Manufactures									
Consumption goods	74.2	73.2	75.4	69.1	77.2	78.8	69.1	79.1	53.3
Capital goods	52.9	45.8	59.8	62.1	63.9	56.3	61.4	65.6	39.0
Construction materials	77.7	77.2	78.3	76.6	84.4	78.3	76.4	83.6	72.4
Producers' supplies *	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
All manufactures	68.9	67.3	70.8	67.3	73.3	72.7	67.3	74.7	54.2
Divisions of Consumption Goods									
Foods	89.7	88.1	93.2	94.2	91.8	93.0	94.5	92.1	82.7
Wearing apparel, etc.	65.2	62.3	68.6	66.9	69.9	69.8	67.2	71.7	41.8
Household goods	70.5	66.4	74.2	71.7	77.1	75.4	67.9	77.8	51.5
Transportation	60.5	63.3	55.8	46.4	48.4	63.2	44.5	47.9	34.6
Publications	72.7	58.9	78.2	64.5	84.6	82.0	59.4	88.6	28.5
Other	96.9	95.9	97.6	96.8	98.8	97.5	96.3	98.1	95.7

* A constant percentage of the items relating to producers' supplies has been assumed to refer to finished goods. The figure, 60 per cent, is based on a survey of the items included in the group.

goods part of four divisions of the capital-consumption goods classification. The entries are finished goods as percentages of the sum of the finished and unfinished goods for the 1929 value of product, elements of cost, employment, and horsepower capacity.

Finished products comprise varying percentages of the totals. Among all consumption goods approximately one-fourth are unfinished and three-fourths finished—that is, three-fourths of the sales of these products enter at once the distribution channels leading to ultimate consumers. On the other hand, the sales value of finished capital goods represents little more than one-half of all capital goods. (The amount paid for materials in the finished capital goods industries is only about 45 per cent of that paid in all industries making capital goods, though the value added by these industries is 60 per cent.) The extent to which products pass from industry to industry is accordingly much greater in the case of capital goods than in that of goods destined for human consumption.

Certain theoretical implications are suggested by the more numerous exchanges that mark the course of capital goods manufacture. For it seems reasonable that where the exchanges between the primary and the final stages of manufacture are more numerous, errors in business judgments have a greater chance to creep in. Not only are more exchanges involved, but also a large part of the demand is further and further removed from the ultimate user. This derived demand becomes less certain, duplications of orders during expansion more frequent, and the surging influence of transmitted demand more evident under circumstances such as we have described for the capital goods industries. There are of course factors that weaken the influence we suggest. For one thing, the integration through common ownership of plants engaged in successive manufacturing operations tends to dispense with some portion of the exchanges that

concern us. Nevertheless the point seems worthy of comment.[14]

In the food industries $12 billion out of $13 billion of product are sold for immediate distribution to ultimate consumers.[15] In the making of transportation goods for domestic use, however, we find almost as high a concentration of unfinished goods as was observed above in the case of capital goods. In some respects the attenuation of the manufacturing process is here greater than in capital goods, for the value of product criterion is not altogether satisfactory. The relative number of employees engaged in the preliminary manufacturing processes is greatest in transportation goods industries at least one stage of manufacture removed from the buying public. In the transportation goods group 55.5 per cent are in the 'unfinished' subgroup as against 38.6 per cent in the unfinished subgroup of capital goods. This is a relative situation only, of course, for the number of wage earners engaged in the preliminary stages of capital manufacture is twice the number of workers whose ultimate products are passenger automobiles or related commodities.[16]

The estimates of capital investment presented in the preceding section cannot be divided between unfinished and

[14] Wesley Mitchell observes that Thorstein Veblen placed considerable importance on what he called "interstitial adjustments" in the industrial process (*Theory of Business Enterprise*, Ch. I and II). Dr. Mitchell suggests, however, that the relative number of individual enterprises engaged in making exchanges rather than the relative volume of sales at different productive levels is more important in affording chances for errors in business judgment, and further that where the number of enterprises is large, the chances of errors offsetting one another will be greater and the disturbing effect on general business stability less. The errors in business judgment contemplated in the text discussion would in all probability not tend to offset one another but rather to cumulate the effects of expansion or contraction.

[15] Examples of the exceptions are sales of sugar and flour to bakeries.

[16] Because of the ramifications of corporate control in the automotive industry and the extent of vertical integration of the processes leading to the finished product, the opportunity for maladjustment of demand and supply suggested in the preceding paragraph is probably not so great as our figures might indicate. On the other hand, the figures relating to the unfinished stages of automobile manufacture are probably underestimated, for it is impossible to pick up all the industries that in some way contribute to the finished automobile. We believe, however, that the important contributing industries are included (see Ap. I) and that no great understatement exists. Indeed, as measures of the total resources utilized in making goods for personal use some overstatement probably exists because of an insufficient allowance for the use of passenger automobiles for productive (capital) purposes.

finished goods industries, since they are based upon the broad groupings of the Treasury statistics. Some evidence on the use of capital in the major stages of manufacture is to be had from the detailed tabulations of capital investment in the Pennsylvania and Massachusetts State Censuses of Manufactures.[17] The median ratio of capital to sales for industries making unfinished goods was 61.8 per cent as against 66.8 per cent for finished goods. These figures suggest a relatively higher capital investment at the finished stages of production. If we turn to the horsepower statistics of Table 5 for a confirmation of this tentative conclusion, we find none. For, as was remarked earlier, clearly the greater relative power investment (though not the greater absolute amount) is in the first manufacturing stages. Table 6 makes this clear: whereas from 67.3 to 74.7 per cent of various items (other than horsepower) relating to all manufactures appear in the 'finished' group, only 54.2 per cent of the horsepower total is in these finished goods industries. If allowance is made for the heavy power requirements of the two quasi-finished groups, construction materials and producers' supplies, the contrast is even more striking.

DURABLE, SEMIDURABLE, AND TRANSIENT GOODS [18]

The manufacture of durable goods has come to play a more and more important role in all manufacturing activity.[19] As standards of living generally have risen there has been an accompanying increase in the output of nontransient goods. In large part the simpler wants relate to nondurable articles —food, heat, and clothing. Of the basic wants, the need for

[17] More extended analysis of these records is made in the latter part of Ch. III.

[18] We return here to a variation of our first classification, that of capital and consumption goods. By definition, all capital goods are durable; indeed, all durable goods may be considered for some purposes to be capital goods. We here subdivide the durable goods total into two groups: (1) durable consumption goods, (2) capital goods and construction materials.

[19] The relative advance in the output of durable goods for both consumption purposes and use as capital equipment is demonstrated in two reports of the National Bureau of Economic Research: *Economic Tendencies in the United States* by F. C. Mills (1932), Ch. 6, and *Commodity Flow and Capital Formation*, Vol. I, by Simon Kuznets (1938).

shelter alone requires the creation of durable goods. As the average levels of economic consumption have risen, including a wider variety of economic goods, durable goods have increased in importance.

Durable goods have increased in importance in manufacturing for yet another reason: the advance in machine technology and the replacement of labor as a direct productive agent by durable capital goods. This has meant the growth of the capital goods industries and the increasing output of producers' durable goods. From two sides, then, we have had forces shifting the balance of the productive structure toward the making of goods of continued use.

Changes in the relative output of durable goods reflect more than long run, structural changes. Here, particularly, we should expect to find alteration in the various relationships in manufacturing production as we shift our base of observation from period to period. In other words, rather marked effects of the fluctuating conditions of business should be expected in our measures. Accordingly, we must repeat, with added emphasis, that the relationships revealed in the study of the 1929 data must be interpreted with reference to the business conditions prevailing in that year. The measures we present are no less important because this is so; the reader simply must not demand from them what they cannot furnish.

Cyclical fluctuations in the output of durable goods are to be expected. The peculiar characteristic of durable goods is that their purchase by a prospective user results in the transfer of a stock of services from the productive agency to the point of consumption. This is true whether the user is an ultimate consumer or a producer expanding the scale of his operations through the installation of a new machine; for in the purchase of a durable good, it is a fund of future services for the most part that is obtained. The inventory of such future services in the hands of consumers, fixed in amount by no definite rule but available in diminishing degree into the

future, is important from the viewpoint of the productive structure, not because of the stability in the usable services enjoyed by the holders of the inventory, but rather because of the instability in the demand on producers of these products for the replacement and replenishing of the stock. The demand for these goods is postponable, yet at times it becomes urgent. In periods of recession both the usefulness of new durable goods and consumer purchasing power are diminished; in periods of more favorable business circumstances the desire and the power to make this demand effective coincide. A powerful contributing influence to cyclical fluctuations in the output of durable goods is the result.

During periods of reduced demand, the usefulness of additional capital goods is obviously less than during periods when wider markets are to be found. Occasionally new capital goods will be found useful even in depression if their installation will replace more costly methods of production. But this usefulness depends on continued output and a prospective customer demand. Even though funds are available for investment the business man will be wary of the future, and there is none, save the producers of the capital goods, who will urge on him the new investment.

Similarly, the consumer finds his demand for durable goods reduced during periods of depression. Expansion in durable consumption goods carries with it in almost every instance a correlative demand for service. Where such service can be rendered by the consumer himself, there need be no deterrent to the purchase of the new durable good, but usually the services are rendered by outside agencies and therefore entail additional costs during periods when such costs cannot readily be carried. During depressions relatively less use is made of automobiles than during more prosperous times, in part because of the costs of gasoline and oil, garage and repair services, taxes and insurance. In less degree there are charges for house service, for gas and electricity, and so forth, that tend to restrict the demand for durable consump-

tion goods. But of course the immediate cause of reduced demand during depression is lower consumer purchasing power. The demand for consumers' and producers' durable goods during depression differs in that the chief restriction on the former is the absence of purchasing power, on the latter it is the limitation of the usefulness, at the moment, of the good in question.

The extended service requirements occasioned by the growth of durable goods have had profound effects on the production structure of the economy. A host of new occupations have been created—the gasoline salesman, the automobile mechanic, and the garage attendant, many employees of the ever widening area of public service (especially that part which is the resultant of the growth of the automobile), the radio repairman, the labor involved in servicing electric and gas appliances. All these nonmanufacturing activities and others correlative with them can be traced to the rise of durable goods.[20] Some services are replaced, such as those attendant upon the use of the horse as a means of travel, but the requirements of the new far exceed the savings on the old. The structure of production expands to draw into its sphere these new producers, and though they have their origin in the durable products of manufactures, they withdraw from manufacturing and similar basic activities a considerable portion of the available productive resources. No analysis of the use made of these resources should overlook this fact.

Within the structure of manufacturing production, however, the growth of durable goods has meant the increasing importance of particular industries. These changes are described elsewhere; the data here presented indicate the relative importance, at a fixed date, of the activity in the manufacture of goods of varying time usefulness. Tables 7 and 8 indicate the distribution of productive resources among dur-

[20] The familiar roadside business venture depends on the automobile for its existence, though in part it replaced, in a different form, a service formerly located in the community. And the entire radio broadcasting industry would not exist if the public did not buy and operate radio receiving sets.

able, semidurable, and transient goods,[21] with cross reference to the consumption-capital goods classification discussed previously.

Analysis of the sales of manufacturing establishments (Table 7) indicates that of all goods, durable goods are of chief importance, comprising some 43 per cent of total factory sales. Semidurable goods, chiefly textiles and finished textile products, are 20 per cent of the value of all commodities. Manufactured transient goods account for the rest.[22] Approximately the same percentage distribution holds for value added, though the transient goods are a smaller percentage of the total, the durable capital goods more. The percentages relating to durable consumption goods and to semidurable goods are about the same for both value added and value of product.

An even greater relative concentration in the making of durable goods holds for wage payments, the increase being chiefly for durable capital goods. Fifty-five per cent of all wage payments go to wage earners engaged in the processing of durable goods; 38 per cent relate to durable capital goods industries alone. The significance of the relatively high wage payments in the production of these durable goods rests, of course, on the peculiarly sensitive character of the demand for durable goods. With a relatively larger area to influence, the cyclical fluctuations in the demand for durable goods

[21] In Tables 7 and 8 durable goods include all capital goods, all construction materials, and those consumption goods whose normal service life is estimated at over two years. Transient goods are presumed to have a momentary service life. Semidurable goods are products with an intermediate service life; for the most part they are textile products and other articles of clothing.

In fitting our various data into the rather simplified classification scheme of the text tables, certain rather arbitrary groupings have been made. Almost all producers' supplies were considered transient, though many contribute ultimately to the production of commodities not so classified. Similarly, there are some construction materials, such as paint, that should properly be considered nondurable. In Ap. VII exceptions to the general classifications are shown in such detail as is possible.

[22] As usual, in order to arrive at these estimates, it has been necessary in certain instances where a given commodity has several uses, not all of which fall in a single category, to divide the value of product or the particular element of cost among the several classes. As before, a common industry ratio was used in these circumstances, based in general on the proportions governing value of product. The divisions for the 34 industries affected are recorded in Ap. I.

Table 7

Elements in the Manufacture of Durable, Semidurable, and Transient Goods, 1929

	Durable Goods			Semi-durable Goods	Transient Goods [2]	All Manufactures
	Total	Capital Goods [1]	Consumption Goods			
Elements of Value of Product (*millions of dollars*)						
Gross value of product	30,311	19,576	10,735	14,459	25,665	70,435
Cost of materials	15,396	9,564	5,832	7,939	15,215	38,550
Value added by manufacture	14,915	10,012	4,903	6,520	10,450	31,885
Wages	6,341	4,430	1,911	2,599	2,681	11,621
Salaries	1,641	1,144	497	678	1,276	3,595
Overhead costs other than salaries, plus profits	6,933	4,438	2,495	3,243	6,493	16,669
Number of Employees (*thousands*)						
All employees	4,967	3,455	1,512	2,669	2,562	10,198
Wage earners	4,357	3,030	1,327	2,427	2,055	8,839
Salaried employees	610	425	185	242	507	1,359
Horsepower of Primary Movers (*thousands*)						
Horsepower	23,376	17,933	5,443	6,581	12,974	42,931
	Percentage of All Manufactures					
Elements of Value of Product						
Gross value of product	43.1	27.8	15.3	20.5	36.4	100.0
Cost of materials	39.9	24.8	15.1	20.6	39.5	100.0
Value added by manufacture	46.8	31.4	15.4	20.4	32.8	100.0
Wages	54.5	38.1	16.4	22.4	23.1	100.0
Salaries	45.6	31.8	13.8	18.9	35.5	100.0
Overhead costs other than salaries, plus profits	41.6	26.6	15.0	19.5	38.9	100.0
Number of Employees						
All employees	48.7	33.9	14.8	26.2	25.1	100.0
Wage earners	49.3	34.3	15.0	27.5	23.2	100.0
Salaried employees	44.9	31.3	13.6	17.8	37.3	100.0
Horsepower of Primary Movers						
Horsepower	54.5	41.8	12.7	15.3	30.2	100.0

[1] Includes all capital goods and all construction materials.

[2] All producers' supplies are considered transient except for a portion ($347 million value of product) classed as consumers' durable. Probably many more of these products are consumed in durable goods industries. In Ap. VII certain modifications of this table are presented, taking account of exceptions to the general classifications.

have an amplified effect upon the stability of receipts by workers in manufacturing. One must remember that not only are the durable goods industries subject to wide cyclical movements because of the capriciousness of demand, but also that the effect of these fluctuations on the manufacturing structure and the entire economy is magnified because of the proportionately large wage payments typical of these industries.

Because of relatively higher wage rates, the percentage of wage earners attached to durable goods industries in 1929 fell below the corresponding figure for wage payments. Nevertheless, roughly half the wage earners in manufacturing in 1929 were engaged in the production of durable goods, and over two-thirds of these made capital goods or construction materials. More than half the rest (27.5 per cent of all wage earners) were employed in the semidurable goods industries. Of all salaried employees, on the other hand, many more were making transient goods, relatively fewer were employed in semidurable goods industries.

When the horsepower statistics are examined, the great power capacity of the durable capital goods and construction materials group is outstanding. Despite the heavy investment in these industries the total for the transient goods group remains high; it is in durable consumption goods and semidurable goods that the horsepower investment is relatively low.

Still another point of interest in Table 7 is the distribution of aggregate overhead expenses other than salaries (plus profits) among the several groups. The distribution pattern is very similar to that of cost of materials. That is, a large proportion of the total, relative to the proportions that obtain for other items, occurs in the transient goods group (38.9 per cent as against 23.2 per cent for wage earners and 32.8 per cent for total value added). Correspondingly a relatively low proportion of both overhead and materials for all manufactures appears in the combined capital goods-construction

materials group. Durable consumption goods and semidurable goods show no markedly different ratios. Plausible explanations of these differences are not hard to find. The food industries stood out, it will be remembered, as one group in the consumption goods total in which overhead costs were high. Since the fabricating process is relatively simple, the number of wage earners is not large. Expenditures on materials and overhead, on the other hand, are heavy. Also the burden of certain distributive expenses probably helps to swell the overhead costs of these and perhaps other consumer products; the lightness of such expenses might well account for the lower overhead charges in capital goods. These interrelations among elements of cost are discussed at much

Table 8

Value Added by Manufacture of Consumption Goods, 1929, classified according to Durability in Use

Ultimate Consumer Use	Durable Goods	Semi-durable Goods	Transient Goods	Durable Goods	Semi-durable Goods	Transient Goods
	(millions of dollars)			(per cent)		
Foods	..	..	4,119	..	..	53.8
Wearing apparel, etc.	308	4,790	130	6.5	81.2	1.7
Household goods	1,935	553	335	40.4	9.4	4.4
Transportation	2,432	463	276	50.8	7.8	3.6
Publications	..	..	1,971	..	..	25.7
Other consumption goods	111	92	827	2.3	1.6	10.8
Total*	4,786	5,898	7,658	100.0	100.0	100.0

* Excludes any part of producers' supplies and construction materials.

greater length, however, in Chapter III where all the data are brought together.

The subgroups of consumption goods do not coincide nicely with the division according to durability. All foods are classified as transient, of course, but many groups have both durable and nondurable subgroups. Table 8 indicates the extent of these subdivisions for the single item 'value added'. Almost all consumers' durable goods fall into two groups:

household goods and private transportation goods. Of the two the automotive group is the greater. Wearing apparel and personal goods are chiefly semidurable, as would be expected; transient products are mostly foods and publications.

GOODS CLASSIFIED ON BASIS OF CHIEF MATERIAL

Manufacturing industries draw upon a variety of sources for the materials they process. From the forest and the mine, the farm and the range, streams of materials flow through the manufacturing process. Iron, wood, and vegetable fibres are the most important, but they are supplemented by a great variety of products not yet in usable form. The final manufactured product is almost always a combination of these materials, but if we select the basic material in each industry we may roughly classify the products of manufactures according to their principal origin.[23]

Certain materials used in manufacturing are purely contributory. They lose their character completely in the manufacturing process, and cannot be identified in the final product. Chief of these materials are the fuels used in manufacturing. Similar is the coke used in smelting iron ore, and the various chemicals used in vulcanizing and processing rubber products. Yet for our purpose the only distinctions that can be made are those that are evident in the final products—which means, of course, a classification based on the dominant, basic material of the industry.

The larger part of manufacturing activity is concerned with nonagricultural materials. Less than one-third of all wage earners manufacture products whose basic materials

[23] In Ap. I the 326 manufacturing industries of 1929 are classified (or divided) according to the various groups discussed in this section (in general the classifications follow those used by the Census of Manufactures). Textiles are classed as vegetable or animal products despite the chemicals used in their manufacture; automobiles are considered metal products despite the textiles and other products necessary to the finished product. To some extent errors arising from such arbitrary classification offset one another in the totals. Where secondary materials are important, the industry totals are allocated in the approximate proportions indicated.

come from the farm. From industry to industry these relationships differ, but in the total the mineral materials predominate. This does not mean that the value of the mineral materials entering the manufacturing system exceeds the value of farm materials used. On the contrary, the total value of agricultural raw materials used in manufacturing industries in 1929 has been estimated at $8,541 million, and the value of nonagricultural materials at $4,135 million.[24] But if we take the estimates of value added of Table 9 to measure the increase in the values of these materials in manufacturing industries, then farm materials were doubled in value through processing while the values of nonfarm materials were increased sixfold.[25]

It is not surprising that farm products should have under-

[24] Estimates of the U.S. Bureau of the Census, *Materials used in Manufactures* (1929), p. 4. Semimanufactured goods imported into the United States for further manufacture are not included though imported raw materials are (agricultural $1,778 million, nonagricultural $426 million). The figures are the "reported or estimated costs of the materials at the factories, . . . which in general combine the values at the farm, mine, etc., with those for such distribution charges as transportation, sales, insurance, and in some cases, middlemen's profits".

The values of different raw materials used in manufacture in 1929 may be contrasted with similar figures for 1899 (*Census of Manufactures, 1900*, VII, cxxxv). Differential price movements of farm and nonfarm products, as well as the changing scope of the Census of Manufactures, affect the figures somewhat. The great increase in the importance of mineral products is obvious, nonetheless.

Raw Materials Used in Manufacturing, 1899 and 1929

Source of Material	1899 Millions of dollars	1899 Per cent	1929 Millions of dollars	1929 Per cent
Farm	1,941	81.2	8,541	67.4
Forest	119	5.0	477	3.7
Mines	320	13.4	3,494	27.6
Sea	9	0.4	39	0.3
Hunting and trapping	not reported		125	1.0
Total	2,389	100.0	12,676	100.0

[25] See Ap. IV for a comparison of the relative contribution of manufacturing industries and raw material producers to the production of manufactured goods, classified by use. Manufacture accounts for only 39 per cent of the final value (at manufacturers' prices) of foods, but 68 per cent of the final value of wearing apparel, 71 per cent of the value of automobiles and supplies, 79 per cent of household goods, 76 per cent of the value of manufactured construction materials, and 86 per cent of the value of capital goods. These percentages are much smaller if related to the values at the point of consumption. For measures of net value at this stage, see *Commodity Flow and Capital Formation*, Vol. I, Simon Kuznets.

gone less processing than nonfarm products. With the exception of cotton and wool fibres, most farm products are not subjected to extensive fabrication. Minerals, on the other hand, must be considerably modified in order to meet man's uses. They must be refined and reshaped; frequently they must be assembled at great expense into elaborate forms.

Of agricultural products used as manufacturing materials, farm crops are approximately half again as important, when

Table 9

Number of Wage Earners and Value Added by Manufacture, 1929

Industries classified according to Basic Material

	Number of Wage Earners		Value Added by Manufacture	
Basic Material	Thousands	Per cent	Millions of dollars	Per cent
Agricultural				
Farm	1,691	19.1	5,533	17.3
Animal	1,002	11.3	3,082	9.7
Nonagricultural				
Forest	1,621	18.3	5,689	17.8
Minerals, metallic	3,292	37.3	11,990	37.6
Minerals, other	529	6.0	2,446	7.7
Mixed	704	8.0	3,145	9.9
Total	8,839	100.0	31,885	100.0

considered in the light of the labor required to fabricate them, as are animal products. We estimate that the processing of farm crops—grains, cotton, vegetables, and miscellaneous products—required in 1929 approximately 1.7 million workers. Animal products, destined chiefly for consumption as foods but also for other purposes, including wool textiles, were fabricated by one million wage earners. The value added in these processes varies in like proportion and totals some eight and one-half billion dollars for the two groups combined.

In the processing of forest materials some 1.6 million manufacturing wage earners were employed in 1929.[20] Twice this number, and over one-third of all wage earners, were engaged in making goods whose primary materials were metals. Another 529 thousand wage earners processed other mineral products; for example, brick, cement, coke, petroleum. In the fabrication of all minerals some $14 billion were added to the value of the materials and of this total roughly $12 billion were associated with metal products.

A final group consists of products so complex or groups so heterogeneous that no allocation according to origin of the basic material was attempted; for example, musical instruments, sporting and athletic goods, chemicals not elsewhere classified. Our estimate is that 704 thousand wage earners were engaged in making these products, with a value added of approximately $3 billion.

The present classification can be crossed with the classification according to ultimate use. Because of the number of variables, the comparison must be simplified, as it is in Table 10. The chief materials in the manufacture of foods are, of course, vegetable and animal products. Vegetable products are likewise important in the manufacture of wearing apparel and personal goods, especially when measured in terms of number of wage earners employed. Animal products (chiefly wool and silk) are also important materials for this group, and in terms of the value added in their manufacture are even more important than other farm products. Of all the materials used in making consumption goods, vegetable products stand first in rank in terms of the processing to which they are subject; metals are second. Metals are of greatest relative importance in the group of capital goods manufacture. Of the wage earners engaged in making capital goods, 84 per cent work on products of which metal is the primary material.

[20] The Census of Manufactures classifies sawmills as manufacturing establishments. Accordingly, the processing of forest materials is merged with much activity frequently considered nonmanufacturing.

Table 10

Number of Wage Earners and Value Added, 1929
Industries classified according to Source of Material and Ultimate Use of Product

Ultimate Use	Source of Basic Material (percentage distribution)
Division of All Manufactures	
Consumption goods	
Employment	Vegetable, 33; metals, 20; animal, 20; forest, 13; other, 14
Value added	Vegetable, 29; metals, 21; animal, 16; forest, 16; other, 18
Capital goods	
Employment	Metals, 84; forest, 10; other, 6
Value added	Metals, 87; forest, 8; other, 5
Construction materials	
Employment	Metals, 43; forest, 34; other minerals, 21; other, 2
Value added	Metals, 49; forest, 23; other minerals, 22; other, 6
Producers' supplies	
Employment	Forest, 51; other minerals, 20; other, 29
Value added	Forest, 43; other minerals, 27; other, 30
Total	
Employment	Metals, 37; forest, 19; vegetable, 19; animal, 11; other, 14
Value added	Metals, 38; forest, 18; vegetable, 17; animal, 10; other, 17
Division of Consumption Goods	
Foods	
Employment	Vegetable, 74; animal, 23; other, 3
Value added	Vegetable, 76; animal, 21; other, 3
Wearing apparel, etc.	
Employment	Vegetable, 40; animal, 37; other, 23
Value added	Animal, 38; vegetable, 34; other, 28
Household goods	
Employment	Metals, 35; forest, 26; vegetable, 15; other, 24
Value added	Metals, 41; forest, 22; vegetable, 9; other, 28
Transportation	
Employment	Metals, 75; forest, 12; other, 13
Value added	Metals, 75; forest, 11; other, 14
Publications	
Employment	Forest, 83; other, 17
Value added	Forest, 89; other, 11

A somewhat more detailed classification than that in Table 10 recognizes the character of the material, separating, for example, other vegetable products from vegetable fibres used in textiles.[27] The application of this scheme of classification is more difficult, for the detailed groups make a rigorous division of complex manufactured products a troublesome task. But the results are more informative, in that they distinguish the more important materials. The eight groups are shown in Table 11.

Iron is the chief material used in manufacturing. In some form or other it is probably included among the materials or supplies of almost every manufacturing industry. In many industries it is the basic material of manufacture, the material that gives form and character to the product. Over two and a half million workers, that is, over 30 per cent of all manufacturing labor, were employed in 1929 in making goods out of this basic material. This labor expenditure in manufacturing is one of the requirements of an 'iron age'.[28]

Table 11

Number of Wage Earners and Value Added by Manufacture, 1929

Industries classified according to Basic Material

Basic Material	Number of Wage Earners		Value Added by Manufacture	
	Thousands	Per cent	Millions of dollars	Per cent
Vegetable products, other than fibres	689	7.8	3,358	10.5
All fibres	1,456	16.4	3,440	10.8
Animal products	548	6.2	1,818	5.7
Wood	1,620	18.3	5,689	17.8
Iron	2,729	30.9	9,873	31.0
Nonferrous metals	563	6.4	2,117	6.6
Nonmetallic minerals	530	6.0	2,445	7.7
Mixed	704	8.0	3,145	9.9
Total	8,839	100.0	31,885	100.0

[27] This classification is similar to that used in the Canadian Census of Manufactures.
[28] In some degree, this cost arises from the manufacture of products for export for which other goods and services are received in exchange. In terms of value, the exports of various iron and steel products in 1929 exceeded imports of similar products by $1,258 million.

338.4

The changing structure of manufacturing production has been marked by the increasing importance of the fabrication of iron. In 1929, 82 per cent of all pig iron was converted into steel; in 1899, 72 per cent. The value added in manufacturing iron and steel products was $9 billion in 1929; $1 billion in 1899. In contrast to this ninefold increase, the value added by all other manufactures in 1929 was but six times that of 1899.[29] In 1899 the manufacture of iron and steel products contributed 21.5 per cent of all value added. By 1929 the relative advance of steel production had raised this ratio to approximately 30 per cent.

The manufacture of products from wood required in 1929 over one and one-half million wage earners, and about the same labor force was engaged in manufacturing processes whose raw materials are fibres, chiefly of course the textile industries. Only one-half million wage earners processed other vegetable materials, for the most part foodstuffs, though the increase in value through this processing was almost as great as that resulting from the manufacture of products from fibre. In part this relatively greater value in foodstuffs probably arises from distribution costs borne by the manufacturer.[30]

As mentioned above, the character of our comparison tends to overemphasize the importance of major materials. Where a material plays a secondary or minor role in the manufacture of a given commodity, it is not associated with that product in the compilation just made. For example, chemical products are perhaps the most widely used of all materials, though in value they may be relatively minor. Hardly an industry

[29] The value added figure of $9 billion here cited is slightly less than that given in Table 11 because of the omission of several small industries. Since the Bureau of Labor Statistics index of the wholesale prices of metal and metal products increased but slightly over this period (4.4 per cent) we may conclude that changing price levels have no serious effect on the comparison. In physical volume terms pig iron output in the United States increased threefold between 1899 and 1929, the output of steel ingots and castings fivefold.

[30] Total overhead costs plus profits (including salaries) per wage earner were $3,300 in 1929 in the Food and Kindred Products Group of the Census as against $1,400 for Textiles and their Products. Per capita wages also were lower in the textile industries.

exists but employs these products either directly or indirectly. They spread throughout the entire range of manufacturing operations. Like the fuels, they do not give the dominant character to a product; they are contributory. Frequently the least expensive of the raw materials of manufacturing, they are just as frequently among the most essential. Without them, much manufacturing activity would cease. Although these chemicals are of such prime importance to manufacturing, our methods of classification tend to subordinate them. Their true significance must be measured against other standards.

SUMMARY

To create the manufactured product of 1929 required the combined effort of many men, working with an accumulated capital supply of many years' contriving. Men, machines, and basic materials comprise the economic resources that make manufacturing production possible. The present survey has been concerned with the allocation in 1929 of these productive resources among four classes of manufactured goods. The method of analysis has called for the division, according to these groups, of data on certain measurable aspects of manufactures: (1) gross value of product and elements of cost, (2) factors relating to labor supply, (3) factors relating to capital supply. The analysis of these data tells us the directions in which productive energies were expended, how these resources were allocated in the creation of various types of goods, what types of materials required more processing and what were the costs of processing, and at what stages of manufacturing these resources were utilized.

In 1929 by far the greater part, approximately 70 per cent, of productive activity can be associated with the manufacture of goods destined for human consumption. The other 30 per cent was devoted to making goods eventually used for capital purposes.

In the analysis of the manufactured product we designate

approximately 10 per cent of the total (the percentage varies with the criterion chosen) as manufactured construction materials, another 10 per cent as producers' supplies. These two groups are considered to be mixtures of capital and consumption goods. The rest, approximately 80 per cent of the total, can be clearly identified as destined either for capital or for consumption use. Operations contributing to the manufacture of these clearly identified consumption goods are reflected in measures of 60.3 per cent of total gross value of product and 57.5 per cent of total value added by manufacture. The corresponding figures for the capital goods group (other than construction materials) are 19.8 per cent of value of product, 22.1 per cent of value added. The differences reflect the more important role played by materials in the total sales of consumption goods.

One general conclusion from the measures presented in the tables of this chapter is that there is much similarity in the allocation of economic resources among the types of goods studied. In general, the ratios for the various items do not differ widely.

If we are to summarize some of the more outstanding distribution patterns we should recall the relative importance of the capital goods share of aggregate wages and relatively low percentage of total overhead other than salaries plus profits. Of number of wage earners and man hours of employment a larger share (relative to output) falls to the capital goods group. On the other hand, in the allocation of fixed capital, the minor groups, construction materials and producers' supplies, have the greater percentage of the total relative to their share in other items. This is a gain won not at the expense of the capital goods group, but largely by a reduction in the percentage identified with consumption goods. Only one-half of total fixed capital is identified with this group. In the total of all circulating capital, however, the consumption goods group has its usual share, if not more. The share of the capital goods industries in aggregate capital

is unusually low. In the total of all horsepower capacity of primary movers, however, the percentage associated with the capital group is high. Even then the share is not increased over the usual ratio by as much as are the shares of construction materials and producers' supplies. The lowest relative ratio for horsepower is in the consumption goods group. Indeed, of all the items for the consumption goods group studied, the relative share of total horsepower is the lowest.

When we analyze these several groups in further detail we find that of the various types of manufactured consumption goods considered, foods and personal goods (clothes and equipment) are the largest items, with household supplies and transportation goods of almost equal importance. Striking differences in the allocation of different productive resources are revealed in these smaller groups, for there is less of the offsetting of opposite relationships that serve to dampen the contrasts in the broader groups.

About 65 to 70 per cent of manufacturing activity is centered in industries that may be classified as 'final stage' —industries whose products receive no further processing within the manufacturing structure.[31] Again this percentage varies from item to item: it is highest for salaries paid and number of salaried employees, lowest for horsepower investment. A much higher percentage of consumption goods manufacture comes from final-stage industries, particularly in the food subgroup. Capital goods, on the other hand, appear less frequently as finished products. Among consumption goods, transportation products have a similarly extensive background within the manufacturing system.

Capital goods, construction materials, consumers' transportation goods, and a few others are durable goods. These products of long service life, taken together, account for some 47 per cent of all value added, 55 per cent of total wages. Durable consumption goods are about one-third of

[31] In certain industries only a portion of the products are classified as finished (see Ap. I).

all durable goods, but less than the total of semidurable (consumption) goods. Transient goods are approximately equal to the other two consumer divisions combined except for the items wages and number of wage earners.

Finally we have examined the products of manufacturing industries according to the source of the basic raw materials. As might be supposed, the basic materials of most manufactured goods are minerals. Particularly is this true of capital goods. Approximately 43 per cent of all manufacturing wage earners are engaged in fabricating mineral products; the ratio is 84 per cent for capital goods alone. The processing of agricultural products of all kinds required 30 per cent of all wage earners; forest products some 18 per cent, mixed products the rest. Nonfarm materials receive the relatively greatest degree of fabrication. We estimate that in 1929 farm products entering the manufacturing system were approximately doubled in value through processing (values at the factory stage) whereas nonfarm products increased in value some six times.

The purpose of this chapter has been to appraise the budgeting of the nation's productive resources in the manufacturing field. This task has been approached with hesitation. To provide the figures for 1929 alone has meant the forecast of the use made of commodities unfinished at the time the Census records were compiled. It has required certain assumptions as to equivalence of cost within given industries. It has presupposed the easy identification of consumption and capital goods, of finished and unfinished goods, durable and nondurable, farm and mineral. These and other problems have been considered with as much care as possible. Close inspection and very often extensive calculations have provided the industry divisions (Ap. I) that in turn support the totals presented above. Despite the inexactness of the estimates they remain our best approximations to the aggregates we wish to determine. As such, they help to define the

roles of capital and consumption goods and related products in the manufacturing structure.

The second phase of the analysis of the structure of manufactures is to determine, as of 1929, the importance of various elements of manufacturing cost and the relative use of labor or capital, and to examine the industrial differences in these relationships. The measures described thus far contribute materially to this analysis, but we shall also present in the next chapter measures constructed for the purpose of exploring industrial variations in these aspects of the manufacturing structure. Taken together we believe the measures add materially to existing information about the interrelations of productive factors in manufacturing activity.

III

Interrelations of Productive Factors

One aspect of the structure of manufacturing concerns the relative use made of different productive elements. The analysis in Chapter II of the distribution of productive resources among different classes of manufactured goods touched on the character of these relations. We now deal directly with the relative importance of productive factors, as they are identified for these groups and for the individual industries reported in the 1929 Census. Whereas previously we have been interested in absolute totals (total number of wage earners or aggregate wages paid, for example), the interrelations of productive factors within the manufacturing establishment or industry now concern us. We first present measures of the relative importance of elements of manufacturing cost. Use is made of the estimates of Chapter II in this section, since ratios of certain of the aggregates there presented provide average measures of relative manufacturing cost for different classes of goods. Some use is also made of these aggregates in the second major division of this chapter, which examines certain direct measures of the role of different productive factors, particularly the number of wage and salaried workers and capital investment. The first section, however, and particularly that part relating to fabrication costs, treats of the use of productive factors in the light of the relative payments for their use.

ELEMENTS OF MANUFACTURING COST AS MEASURES OF THE APPARENT CONTRIBUTIONS OF DIFFERENT PRODUCTIVE FACTORS

Manufacturing costs as percentages of value of product

In Chapter II the cost of materials entering into processes leading ultimately to finished consumption goods was separated from the cost of materials associated with capital goods, and totals for each type of goods were then computed. Likewise the total value of product for these goods was secured and also totals for the other elements of cost. Ratios of different cost items to value of product can be simply computed from these aggregates (Table 12).

Material costs, which include the cost of purchased fuels, comprised the largest single element in the value of manu-

Table 12

Elements of Cost as Percentages of Value of Product, 1929

Manufacturing Industries classified according to Ultimate Use of Product

Ultimate Use	Material Costs	Total Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Consumption goods	56.8	43.2	14.3	4.8	24.1
Capital goods *	49.9	50.1	20.3	5.8	24.0
Construction materials	50.2	49.8	20.1	5.6	24.1
Producers' supplies	57.0	43.0	14.0	4.9	24.1
All manufactures *	54.9	45.1	15.9	5.1	24.1
Consumption goods					
Foods	68.1	31.9	7.6	2.5	21.8
Wearing apparel, etc.	54.1	45.9	18.5	4.8	22.6
Household goods	47.9	52.1	19.9	6.2	26.0
Transportation	61.9	38.1	14.0	3.1	21.0
Publications	28.4	71.6	17.9	15.1	38.6
Other	40.5	59.5	12.8	9.5	37.2

* Steam and electric railroad repair shops have been excluded from the aggregates in calculating these ratios because of the serious underreporting of overhead costs in these industries. Value of product in these industries represents, in general, the cost of materials plus wages and salaries paid to shop employees. There is no sum covering the other overhead expenses or profits as in other industries (*Census of Manufactures, 1929*, II, 1247).

factured products in 1929. In all industries combined, cost of materials was approximately 55 per cent of value of product.[1] Material costs were relatively high (57 per cent of value of product) in industries making consumption goods, as compared with such costs in industries making capital goods (50 per cent). The ratios for construction materials and capital goods are approximately the same as are the ratios for producers' supplies and consumption goods. This agreement is interesting in view of the fact that construction materials for the most part ultimately serve capital purposes while producers' supplies contribute largely to the production of consumption goods. Examination of the ratios for the other components of value of product reveals a similar relationship among these groups for the items wages and salaries. Here, however, the larger relative expenditure is identified with the manufacture of capital and construction goods. Costs of overhead (less salaries but including profits) reveal no appreciable differences among the four major groups. Providers of materials, it appears, are relatively the more important, so far as their share of sales value is concerned, in the manufacture of consumption goods and related products. Manufacturing labor, on the other hand, accounts for a relatively larger share of the value of capital goods.

Variations in these cost relations within the consumption goods group may be explored by examining the ratios for the six major subgroups in Table 12. Foods and the transporta-

[1] Despite changing prices and the changing composition of manufacturing output, the ratio of cost of materials to selling value for all manufactures has not varied much since the turn of the century. In the following table, cost of materials, wages, and overhead plus profits are shown as percentages of aggregate value of product for five selected years. (The 1929 figures differ slightly from those of the text.)

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Year	Value of Product	Cost of Materials	Wages	Salaries and other Overhead Costs, plus Profits
1899	100.0	57.6	17.6	24.8
1909	100.0	58.7	16.6	24.7
1919	100.0	60.0	16.8	23.2
1929	100.0	54.7	16.5	28.8
1935	100.0	57.4	16.5	26.1

tion group have, relatively, the highest payments for materials, the household goods, wearing apparel, and publications groups the highest wage payments. Salaries are greatest, relatively, in the publication group, as are other overhead costs.

No similar subdivisions by type of product are available for the capital goods group. But we do have, from Chapter II, the subdivision of both capital and consumption goods according to stage of manufacture and durability in use. In Table 13 the relative importance of different costs is shown for these divisions of capital and consumption goods.

Table 13

Elements of Cost as Percentages of Value of Product, 1929

Additional Groups and Subgroups of Manufacturing Industries [1]

Economic Group	Material Costs	Total Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Classification based on Stage of Manufacture and Ultimate Use of Product					
Finished goods, total [2]	53.7	46.3	15.2	5.4	25.7
Consumption goods	56.1	43.9	13.3	5.0	25.6
Capital goods	42.6	57.4	22.1	7.3	28.0
Unfinished goods, total [2]	57.5	42.5	17.4	4.4	20.7
Consumption goods	59.0	41.0	17.0	4.2	19.8
Capital goods	56.8	43.2	18.5	4.5	20.2
Classification based on Durability in Use					
Durable goods, total	51.1	48.9	19.6	5.4	23.9
Capital and construction goods	49.3	50.7	20.7	5.8	24.2
Consumption goods	54.3	45.7	17.8	4.6	23.3
Semidurable goods	54.9	45.1	18.0	4.7	22.4
Transient goods	59.3	40.7	10.4	5.0	25.3

[1] Excluding steam and electric railroad repair shops (see footnote to Table 12).
[2] Both the finished and the unfinished goods totals include construction materials and producers' supplies, not here given.

Finished capital goods have the same relatively low material costs but relatively high wage costs, as percentages of sales, observed for the capital goods group as a whole. The pattern for unfinished capital goods, on the other hand, is

more nearly that of consumption goods. As the totals for unfinished and finished goods show, the overhead item is relatively the higher at the finished stage regardless of the type of product. Wages are the much higher, relatively, for capital goods in the finished goods group, and by a smaller margin in the unfinished goods total also.

When we turn to the durable goods division, we find no great similarity between durable consumption goods and durable capital goods [2] with respect to costs. Rather there is closer agreement between the cost patterns of the durable and semidurable consumption goods groups. In each, material costs are higher percentages of total cost than they are in the capital goods division, though considerably below those for transient goods.[3] The transient goods group includes the food industries, where the manufacturing contribution is frequently restricted to simple processing operations. As was seen in Table 12, the cost of materials in the foods group exceeded two-thirds of the total value of product.

The figures in Tables 12 and 13 are ratios of aggregate costs to aggregate values of the particular types of product discussed in Chapter II. Differences between the figures are significant because the groups to which they relate are totals of manufacturing enterprises. On the other hand, the aggregates have been secured by grouping individual industries according to certain classification schemes. The extent of industry to industry variation in these cost ratios is shown by the records of individual industries.

In preparing the data for the following tables, the 326 manufacturing industries of 1929 have been classified according to the capital-consumption goods division.[4] Seventy-

[2] Here capital goods include all manufactured construction materials.
[3] Transient goods include most producers' supplies as well as goods directly associated with consumption purposes.
[4] The same analysis could be made with varying success for each classification discussed in Ch. II. It is not necessary to do so, however, to demonstrate the industry to industry variation in the ratios of aggregates. The detailed industries measures in Ap. II and their classification in Ap. I make it possible for the interested investigator to extend the analysis to other classifications. The capital-consumption goods division seems most significant for our industry study.

two industries have been classified as dominantly capital producing, while 254 industries are considered to make consumption goods chiefly. The minor divisions of construction materials and producers' supplies are merged into the two major groups.[5] The arbitrary assignment of whole industries

Table 14

Cost of Materials, Wages, and Overhead Costs plus Profits as Percentages of Value of Product, 1929

326 Manufacturing Industries classified according to Ultimate Use of Product

Percentage of Value of Product	Classification of Industries [1] according to Cost of Materials		Wages		Overhead Costs plus Profits [2]	
	Consumption goods	Capital goods	Consumption goods	Capital goods	Consumption goods	Capital goods
0– 4.9	1	..	15	2	..	..
5.0– 9.9	..	..	41	4	3	5
10.0–14.9	4	2	43	7	10	1
15.0–19.9	4	2	40	19	11	5
20.0–24.9	7	2	52½	18½	32	4
25.0–29.9	13	5	29	11	40	9
30.0–34.9	24½	7½	19½	4½	51½	8½
35.0–39.9	20	15	6	3	47½	9½
40.0–44.9	27½	8½	7	1	27	16
45.0–49.9	41	6	..	..	11	8
50.0–54.9	24	6	..	1	5	3
55.0–59.9	30	6	1	1	8	2
60.0–64.9	15	4	..	..	6	1
65.0–69.9	20	2	..	..	1	..
70.0–74.9	2	..	..	..	..	..
75.0–79.9	5	3	..	..	..	..
80.0–84.9	10	..	..	..	1	..
85.0–89.9	4	2	..	..	..	..
90.0–94.9	2	1	..	..	..	..
Median (per cent)	48	41	19	21	33	37
Avg. deviation from median	13	13	8	7	9	10
Avg. deviation as percentage of median	27	32	42	33	27	27

[1] Two industries, lumber and timber products and electrical machinery, have entered each classification with half weight.
[2] Includes all salaries.

[5] See Ap. I for the identification of the 72 capital goods industries. Two large industries, lumber and electrical machinery, have been divided equally between the two groups.

to one group or another differs sharply from the analysis by parts that contributed the estimates of Chapter II. However, the industry ratios in Table 14 do reveal interesting variations from industry to industry with respect to relative manufacturing costs.

Ratios of cost to sales value vary considerably in both the total of all industries and in the two groups of industries examined in Table 14. The different items of cost, as percentages of sales, vary over as wide ranges for consumption goods as for capital goods industries. The average deviation from the different median percentages are also approximately equal. For the cost of materials item these median percentages are 48 and 42 in the consumption and capital goods groups respectively. As has been demonstrated above, material costs are higher, relative to value of product, in consumption goods industries than in industries making capital goods. On the other hand, the costs of wages and overhead (here including salaries) are relatively greater in the capital goods industries.

The median industry measures of Table 14 differ somewhat from the general averages of Table 12. One reason is the arbitrary character of the industry classification compared with the detailed analysis of industry totals that underlies the group averages. A more important reason is that the measures in Table 14 give no greater weight to the larger industries, as do the over-all ratios.[6] In this connection the tabulation of the ratios of different items of cost to value of product for the largest 20 manufacturing industries in 1929 is of interest (Table 15).

Looking first at the ratios of cost of materials to value of product in Table 15 we find that in the two printing and publishing industries (newspapers and periodicals, and book and job printing) these costs are relatively low, being only

[6] Manufacturing industries vary greatly in size, as the tabulation shows. There is no marked industrial bias in the relation of number of industries to number of wage earners. The number of industries in the Census food group comprised 9.8 per cent of all industries, they employed 8.5 per cent of all wage earners in 1929. In the textile

Table 15

Cost of Materials, Wages, and Overhead Costs plus Profits as Percentages of Value of Product, 1929

20 Selected Manufacturing Industries

Industries Ranked by Value Added [1]	Cost of Materials	Wages	Overhead Costs plus Profits [2]
1 Foundry and machine shop products * (1,4)	37	25	38
2 Iron and steel: Steel works and rolling mills (4,3)	57	21	22
3 Printing and publishing, newspaper and periodical (17,7)	23	15	62
4 Electrical machinery, apparatus, supplies (6,6)	42	20	38
5 Motor vehicles, not incl. motorcycles (7,1)	65	10	25
6 Lumber and timber products * (3,12)	33	33	34
7 Bread and other bakery products (11,10)	48	18	34
8 Clothing, women's * (13,8)	55	14	31
9 Printing and publishing, book and job (14,16)	26	25	49
10 Cigars and cigarettes (19,14)	33	8	59
11 Motor vehicle bodies and motor vehicle parts (8,9)	56	24	20
12 Steam railroad repair shops (5,13)	44	50	6
13 Cotton goods (2,11)	59	21	20
14 Petroleum refining (26,5)	77	5	18
15 Furniture, incl. store and office fixtures (12,20)	45	26	29
16 Clothing, except work, men's, youths', and boys' (15,22)	49	20	31
17 Meat packing, wholesale (18,2)	87	5	8
18 Boots and shoes, other than rubber (10,19)	53	23	24
19 Knit goods (9,23)	51	23	26
20 Paper (20,18)	59	15	26
Median (per cent)	50	21	28

[1] The rank indicated is that in the total of 326 industries. The numbers in parentheses following the industry title refer to rank by number of wage earners and value of product respectively.

[2] Includes all salaries.

* Not elsewhere classified.

23 and 26 per cent of total value of product. On the other hand, material costs bulk very large in meat packing (87 per cent) and petroleum refining (77 per cent). Matching these extremes are high percentages of salaries and overhead for the two publication industries and low ratios for both wages and overhead in meat packing and petroleum. In the last-named industries, wage payments were but 5 per cent of value of product. The wage figure is highest (50 per cent) for steam railroad repair shops, but the figure is biased because the estimated value of product excludes profits and makes inadequate allowance for overhead. The medians of the measures for these 20 industries are 50 per cent of total value of product paid for materials, 21 per cent for wages, and 28 per cent as payments for salaries and other items of overhead plus profits.

Fabrication costs as percentages of value added

As we have seen in the preceding section, the most important single item of cost in most industries in 1929 was the cost

group were 16.3 per cent of all industries, 19.3 per cent of all wage earners. The greatest disparities are in the chemicals and allied products group, which included 10.1 per cent of all industries but only 3.2 per cent of all wage earners, and in the machinery group, which included 4.9 per cent of all industries but 12.3 per cent of all wage earners.

Wage Earners per Industry, 1929 (thousands)	No. of Industries	Percentage Distribution by Industries	Percentage Distribution by Wage Earners
0.0– 4.9	132	40.5	3.1
5.0– 9.9	55	16.9	4.4
10.0– 14.9	35	10.7	4.7
15.0– 19.9	21	6.4	4.1
20.0– 24.9	14	4.3	3.6
0.0– 24.9	257	78.8	19.9
25.0– 49.9	31	9.5	12.2
50.0– 74.9	10	3.1	6.7
75.0– 99.9	8	2.5	7.8
0.0– 99.9	306	93.9	46.6
100.0–199.9	9	2.8	14.4
200.0–299.9	5	1.5	12.0
300.0–399.9	3	0.9	12.3
400.0–499.9	3	0.9	14.7
Total	326	100.0	100.0

of materials. Material costs represent contributions of productive factors outside the particular industry to which they apply. In the total value of product of all industries, cost of materials is a duplicating item because of the transfer of unfinished products from industry to industry. The analysis of the contributions of productive factors in manufacturing is incomplete without comparisons excluding cost of materials. Indeed, from many points of view, cost comparisons are of distinctly greater significance when made on this restricted basis.

By using once again certain aggregates of Chapter II we compute measures of the relative contributions by different productive factors in manufacturing operations alone. By definition, the total of these contributions (using the term without ethical implication) is the value added by manu-

Table 16

Fabrication Costs as Percentages of Value Added, 1929

Manufacturing Industries classified according to Ultimate Use of Product

Economic Group	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Consumption goods	33.0	11.1	55.9
Capital goods*	40.4	11.7	47.9
Construction materials	40.3	11.2	48.5
Producers' supplies	32.6	11.3	56.1
All manufactures*	35.2	11.3	53.5
Consumption goods			
Foods	23.7	8.0	68.3
Wearing apparel, etc.	40.4	10.4	49.2
Household goods	38.2	11.9	49.9
Transportation	36.8	8.1	55.1
Publications	25.0	21.1	53.9
Other	21.5	16.0	62.5

* Steam and electric railroad repair shops have been excluded in the calculation of these ratios because of the underreporting of overhead costs (see footnote to Table 12).

facture. Accordingly in Tables 16 and 17 wages, salaries, and overhead costs other than salaries, plus profits, are shown as percentages of value added for the various groups of manufacturing industries discussed previously.

The similarity noticed in Table 12 of the cost ratios for consumption goods and producers' supplies, on the one hand, and capital goods and construction materials, on the other, appears also in Table 16. Wage payments were relatively heavier in the capital and construction goods industries (40.4 and 40.3 per cent of all value added in contrast to a ratio of 33.0 per cent for consumption goods). Conversely, overhead expenses other than salaries but including profits were relatively greater in the consumption goods and producers' supplies groups. The six subdivisions of the consumption goods

Table 17

Fabrication Costs as Percentages of Value Added, 1929

Additional Groups and Subgroups of Manufacturing Industries

Economic Group	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Classification based on Stage of Manufacture and Ultimate Use of Product			
Finished goods, total*	32.8	11.7	55.5
Consumption goods	30.2	11.4	58.4
Capital goods	38.6	12.6	48.8
Unfinished goods, total*	40.9	10.3	48.8
Consumption goods	41.5	10.4	48.1
Capital goods	42.8	10.4	46.8
Classification based on Durability in Use			
Durable goods, total	40.2	11.0	48.8
Capital and construction goods	40.8	11.4	47.8
Consumption goods	39.0	10.1	50.9
Semidurable goods	39.9	10.4	49.7
Transient goods	25.7	12.2	62.1

* Both the finished and the unfinished goods total include construction materials and producers' supplies, not shown separately.

total help to locate in foods and the miscellaneous group the source of these relatively large expenditures for overhead other than salaries.

In both the consumption and capital goods divisions, those industries that relate to the finished manufacturing stage have the higher percentage of value added attributed to the overhead item, the lower ratio for wage payments. A possible explanation of this relationship is that the manufacture of standardized finished products is marked by greater use of machine production with its attendant high labor productivity. What is more probable is that included among overhead charges are certain distributive costs borne by the manufacturer [7] that will of course be larger when the market is scattered, when the consumer can be influenced by sales effort, and when competition is keen. These conditions are more common in the marketing of finished than unfinished products [8] and when the good is destined for consumption than capital purposes. Still another possible reason for relatively high overhead costs for finished goods is that as later production stages are reached, the form of the manufactured product becomes more varied and larger inventories become necessary. Moreover, the per unit value of the inventory increases at the later stages, requiring for approximately the same physical inventory a greater investment and a heavier overhead charge. Finally, excise taxes are more frequently levied on finished manufactured products, and taxes are included in the overhead item. Several of these observations apply with more force to finished consumption goods than to finished capital goods. It will be noted that the difference between the overhead item for unfinished and finished consumption goods is considerably more than the difference for capital goods.

Salary payments, and by implication salaried workers, are

[7] See the next section of this chapter for a discussion of the components of the residual item, value added less wages and salaries.

[8] To the extent that the unfinished products flow directly into plants under the same ownership, almost no distributive costs of the kind we have in mind will be present.

relatively no more important in the manufacture of capital goods than in the manufacture of consumption goods. Slightly more importance is placed on salaried workers at

Table 18

Fabrication Costs as Percentages of Value Added, 1929

Unweighted Distributions of Manufacturing Industries classified according to Ultimate Use of Product

Percentage of Value Added	Classification of Industries according to Wages: Consumption goods	Wages: Capital goods	Salaries: Consumption goods	Salaries: Capital goods	Overhead Costs other than Salaries, plus Profits: Consumption goods	Overhead Costs other than Salaries, plus Profits: Capital goods
0– 4.9	..	..	5	1	..	2*
5.0– 9.9	3	..	55½	18½	..	..
10.0–14.9	15	..	112½	23½	..	..
15.0–19.9	21	..	69	21	..	..
20.0–24.9	17	5	9	7	..	1
25.0–29.9	28	13	2	..	2	3
30.0–34.9	27½	10½	..	1	10	1
35.0–39.9	45	19	..	..	25	5
40.0–44.9	43	12	1	..	49½	7½
45.0–49.9	29½	3½	..	..	39	13
50.0–54.9	19	3	..	..	27½	15½
55.0–59.9	5	2	..	..	27	11
60.0–64.9	1	2	..	..	19	10
65.0–69.9	..	..	..	..	18	2
70.0–74.9	..	..	..	..	15	1
75.0–79.9	..	..	..	..	16	..
80.0–84.9	..	..	..	..	3	..
85.0–89.9	..	2*	..	..	3	..
Median (per cent)	36.7	36.7	13.0	13.5	50.3	51.5
Arith. avg. (per cent)	35.0	37.1	13.2	13.8	53.2	50.6
Avg. deviation from median	9.9	7.1	3.4	4.3	11.1	7.9
Avg. deviation as percentage of median	27.0	19.3	26.2	31.9	22.1	15.3

* Railroad repair shops, steam and electric. Because of the faulty reporting of overhead other than salaries (plus profits) in these industries, the two extreme ratios are excluded from the averages given at the foot of the table.

the final manufacturing stage, as is to be expected if the problems of distribution are greater at this stage.

The relatively high wage payments in the capital goods industries have already been commented upon. Approximately the same relationship applies to all durable goods and to semidurable goods as well. It is in the third group, transient goods, that wage payments are relatively low percentages of value added. Similarly there are no wide dif-

Table 19

Fabrication Costs as Percentages of Value Added, 1929

Weighted Distributions of Manufacturing Industries classified according to Ultimate Use of Product

(each entry is the value added by manufacture, in millions of dollars, in the corresponding industries of Table 18)

Percentage of Value Added	Wages		Salaries		Overhead Costs other than Salaries, plus Profits	
	Consumption goods	Capital goods	Consumption goods	Capital goods	Consumption goods	Capital goods
0– 4.9	..	..	946	161	..	722[1]
5.0– 9.9	368	..	8,026	2,783	..	..
10.0–14.9	1,263	..	9,696	4,738	..	..
15.0–19.9	3,012	..	3,055	775	..	..
20.0–24.9	1,175	39	1,446	95	..	31
25.0–29.9	3,008	485	17	..	27	293
30.0–34.9	3,014	1,000	..	1	125	2
35.0–39.9	4,260	1,503	..	..	2,092	63
40.0–44.9	2,219	2,489	146	..	4,088	846
45.0–49.9	2,989	1,940	..	..	2,469	3,924
50.0–54.9	1,959	93	..	..	3,452	1,714
55.0–59.9	64	33	..	..	3,828	340
60.0–64.9	1	249	..	..	601	413
65.0–69.9	..	..	..	..	3,363	44
70.0–74.9	..	..	..	..	1,409	161
75.0–79.9	..	..	..	..	707	..
80.0–84.9	..	..	..	..	317	..
85.0–89.9	..	722[1]	..	..	854	..
Avg. percentage of value added[1]	33.5	41.3	11.8	11.1	55.6	49.0

[1] The two extreme ratios relating to railroad repair shops, steam and electric, have been excluded from the averages.

ferences in the overhead plus profits item, relative to value added, for durable and semidurable goods. A notably higher percentage is evident for transient goods, however.

Again we shall seek to add to our information about the elements of value added by classifying the 326 manufacturing industries into the consumption goods-capital goods divisions utilized previously. In Table 18 the unweighted distributions are presented; in Table 19 the distributions are weighted according to value added.

The distributions of Tables 18 and 19 confirm the results derived from the more carefully determined aggregates relating to the manufacture of capital goods and consumption goods (cf. Table 17), although the present comparisons include data for the producers' supplies and construction materials groups. Wages, relative to value added, again tend to be higher, and overhead costs lower, for capital goods industries. Salary payments as percentages of value added are much the same in both groups. There is of course considerable variation in each set of industry measures. While the average percentages at the foot of each table, and the weighted ratios given in preceding tables, define the over-all relationships, they must not be taken to apply to all industries that manufacture the particular class of products to which the averages relate. There were many industries, producing a considerable fraction of total value added, for which the ratios depart noticeably from the general averages. That the unweighted and the weighted averages are not closer is evidence of this variation, as well as of differences by size of industry.[9] Variations in these relative costs with reference to size of establishment are discussed in Appendix VIII.

Elements of overhead costs other than salaries, plus profits

Roughly one-half of the value added by manufactures in

[9] We may refer again to the largest 20 industries in 1929. The following comparison relates to both percentages of value added and of value of product for 1929 and 1935. In most industries material costs and wage payments were higher and overhead plus profits lower in 1935, by relatively small amounts, differences explained in large part by lower profits in the later year.

1929 was paid out as wages and salaries. One element of the residuum is profits, and while Census of Manufactures data do not indicate their magnitude, some information on profits and items of overhead costs is to be found in the corporation statistics gathered in the administration of the federal corpo-

(*footnote* [9] *continued*)

Industry		Percentage of Value Added		Percentage of Value of Product		
		Wages	Overhead costs plus profits*	Materials	Wages	Overhead costs plus profits*
1 Foundry and machine shop products	1929	40	60	37	25	38
	1935	48	52	39	29	32
2 Steel works and rolling mills	1929	47	53	57	21	22
	1935	54	46	57	23	20
3 Printing and publishing, newspaper	1929	19	81	23	15	62
	1935	20	80	20	16	64
4 Electrical machinery	1929	34	66	42	20	38
	1935	34	66	39	21	40
5 Motor vehicles	1929	28	72	65	10	25
	1935	38	62	76	9	15
6 Lumber and timber products	1929	49	51	33	33	34
	1935	53	47	38	33	29
7 Bread and other bakery products	1929	35	65	48	18	34
	1935	44	56	54	20	26
8 Clothing, women's †	1929	31	69	55	14	31
	1935	37	63	49	19	32
9 Printing, book and job	1929	34	66	26	25	49
	1935	33	67	28	24	48
10 Cigars and cigarettes	1929	12	88	33	8	59
	1935	8	92	32	5	63
11 Motor vehicle bodies and parts	1929	54	46	56	24	20
	1935	60	40	65	21	14
12 Steam railroad repair shops	1929	88	12	44	50	6
	1935	89	11	46	48	6
13 Cotton goods	1929	52	48	59	21	20
	1935	61	39	61	24	15
14 Petroleum refining	1929	22	78	77	5	18
	1935	30	70	80	6	14
15 Furniture	1929	47	53	45	26	29
	1935	50	50	48	26	26
16 Clothing, except work, men's †	1929	39	61	49	20	31
	1935	45	55	48	23	29
17 Meat packing	1929	36	64	87	5	8
	1935	41	59	86	6	8
18 Boots and shoes, other than rubber	1929	49	51	53	23	24
	1935	55	45	52	27	21
19 Knit goods	1929	48	52	51	23	26
	1935	59	41	49	30	21
20 Paper	1929	36	64	59	15	26
	1935	39	61	60	16	24

* Includes all salaries. † The 1929 and 1935 figures are not strictly comparable.

ration income tax. Although the data pertain only to corporations (91.5 per cent of total value added by manufacture in 1929 was produced, however, in establishments under corporate ownership or control), and also manufacturing corporations often engage in nonmanufacturing activities, the figures of Table 20 suggest the relative magnitude of profits, of taxes, of depreciation, and certain other costs included in our aggregate of overhead costs plus profits.

Cost of materials, wages, and salaries (including officers' salaries), as reported in 1929 by manufacturing establishments to the Bureau of the Census, accounted for 75.9 per cent of total value of product. Approximately the same items as reported by manufacturing corporations in the Treasury returns comprise 74.5 per cent of the total.[10] Our present interest, however, is in the other items represented in value of product. In the 1929 Census returns these items amount to 24.1 per cent of total value of product; in the Treasury returns, 25.5 per cent. Although these percentages suggest a close relationship between the Census and Treasury statistics it must not be presumed that any great similarity in these data exists. Examination of the material reveals fundamental

(*footnote* [9] *concluded*)
The persistence of the above cost ratios from 1929 to 1935 can be tested by a modification of the correlation technique. The modification consists in the stipulation that the 1929 and 1935 ratios be identical to show perfect correlation (+1.0). The formula employed,

$$\sqrt{1 - \frac{\Sigma(R_{29} - R_{35})^2}{N\,\sigma^2_{R_{35}}}},$$ where R_{29} and R_{35} are the percentage ratios in 1929 and 1935 respectively, gives the following measures:

	Cost of Materials	Wages	Overhead Costs plus Profits
Percentage of value of product	+.97	+.96	+.96
Percentage of value added	..	+.93	+.93

The agreement of the general order of magnitude of these ratios in 1929 and 1935 is evident.

[10] If the base of this last figure were gross sales alone, rather than total compiled receipts, this percentage would be somewhat higher. Unfortunately a satisfactory comparison on this basis is not possible for 1929. Note also that all salaries reported to the Census have been included with wages and cost of materials.

Table 20

Net Profits and Elements of Cost, 1929

Corporations engaged in Manufacturing

	Percentage of Compiled Receipts less Dividends and Interest Received [1]	Percentage of Total less Cost of Goods Sold and Officers' Compensation [2]	Percentage based on Census of Manufactures (approximately comparable)
Cost of goods sold [3]	72.9	..	74.5
Compensation of officers	1.6	..	1.4
Interest paid	1.0	3.9	24.1
Taxes, incl. income taxes	1.6	6.4	
Depreciation	2.4	9.6	
Depletion	0.4	1.5	
Bad debts	0.4	1.5	
Miscellaneous	14.3	55.9	
Net profits, after tax	5.4	21.2	
Total	100.0	100.0	100.0

[1] Total compiled receipts of manufacturing corporations exceed gross sales by reason of $2,988 million received from nonmanufacturing operations or in the form of interest, rents, dividends, or net profit on sale of capital assets. Of this total, $675 million of tax-exempt interest and dividends has been excluded in the calculation of the above percentages. Unfortunately, there is no way to distinguish the costs or profits resulting from manufacturing operations alone. Total compiled receipts in 1929 were $72,224 million, gross sales $69,236 million. Total value of product reported by manufacturing establishments with corporate ownership or control was $64,901 million. The discrepancy in sales probably arises from the greater scope of the corporate data, in that they include sales of nonmanufactured products and undoubtedly are often in terms of prices at some stage beyond the factory door. Moreover, the Census figures exclude establishments with value of product less than $5,000. The Census figures have greater duplication in the value of product total (for example, the estimated value of both pig iron and steel is reported) than have the corporate reports, especially in view of the prevalence of consolidated tax returns for affiliated corporations.

[2] The exclusion of cost of goods and officers' salaries from the Treasury figure of compiled receipts approximates the Census item 'overhead less salaries plus profits'.

[3] Cost of goods sold is reported as cost of manufacturing or producing goods—chiefly wages, salaries, cost of materials, and supplies—plus cost of merchandise bought for sale plus change in inventory during the year. Change in value of inventory enters only in part into the item 'cost of goods sold' (materials plus wages plus salaries) taken from the Census of Manufactures. On most schedules reporting manufacturers were instructed to report as value of product the sales (shipments) for the year, and to report as cost of materials the total cost of all purchased materials consumed during the year. However, materials purchased rather than consumed were reported by some manufacturers. Since little or no account was taken of changing values of inventories,

differences in definition, in scope, and in classification, and discrepancies that are deep-reaching and elusive. In the absence of other information, however, we have made use of the Treasury figures in conjunction with data drawn from the Census, and have sought comfort in the belief that ratios from the two sources are more comparable than are the absolute figures.

Chief among the items of overhead cost other than salaries [11] appearing in the corporation reports is the item 'miscellaneous deductions' admitted by the income tax administrators. Thus less than half (44 per cent) of the overhead less salaries item can be identified on the basis of these data. Taxes, including the federal levies on net income, amounted in 1929 to 6 per cent of overhead less salaries but including profits, and less than 2 per cent of total sales. Interest payments are about half as large as tax payments, being 3.9 per cent of the overhead items we have isolated. Depreciation charges, so far as they are reported, amount to roughly 10 per cent, bad debts to 1.5 per cent of overhead less salaries. Net profits, after income taxes were paid, were 21.2 per cent of the same base (5.4 per cent of total compiled receipts less dividends and interest received). These are average figures, of course. For corporations that made profits the average rate of return was much higher.

As is to be expected, there are industrial differences in

arising either from changing quantities or revaluations due to price changes, the Census and Internal Revenue figures are not directly comparable. It goes without saying that the Internal Revenue figures are better for accounting purposes. In the absence of other data, and because 1929 was not a year marked by severe changes in either prices or stocks, the Census data are adequate for the general purposes at hand. All salaries reported by the Census are here included under cost of goods.

[11] Some part of salary payments must be considered direct costs of manufacturing operations. Wide fluctuations in the number of clerical workers employed by manufacturers undoubtedly occur as volume of output changes. No data bearing on the relative number of salaried employees doing clerical work are available in the 1929 reports, but in 1933 manufacturers reported (on standard schedules) that 55 per cent of the total salary bill (or $706 million) was paid to clerks and other subordinate employees. However, the compensation of salaried officers of corporations was not included in the 1933 totals, although it was in 1929. Officers' salaries for 1933 were reported to the Treasury Department as an identical sum, $706 million. Including officers' salaries in the 1933 total would reduce the figures for subordinate employees to approximately 35 per cent of all salaries.

Table 21

Corporation Statistics on the Cost of Manufacture, by Industrial Groups, 1929

(entries are percentages of total compiled receipts less dividends and interest received by manufacturing corporations)

Industrial Group	Cost of Goods Sold	Officers' Compensation	Interest Paid	Taxes, incl. Income Tax	Depreciation	Misc. Deductions *	Net Profits after Tax
Total manufacturing	72.9	1.6	1.0	1.6	2.4	15.1	5.4
Foods, beverages, and tobacco	80.0	0.9	1.0	1.1	1.5	12.1	3.4
Textiles and textile products	80.6	2.4	0.9	1.1	1.9	11.5	1.6
Leather and leather products	81.5	2.0	0.7	1.0	1.1	11.8	1.9
Rubber and related products	75.7	0.8	1.7	1.0	2.6	17.4	0.8
Lumber and wood products	73.6	2.7	1.6	1.8	2.8	15.6	1.9
Paper, pulp, and products	72.3	2.1	1.9	1.9	3.5	13.1	5.2
Printing and publishing	60.6	4.4	1.1	1.8	2.2	23.0	6.9
Chemicals, etc. (incl. petroleum refining)	62.3	0.9	1.2	2.4	4.2	21.4	7.6
Stone, clay, and glass products	65.1	2.9	1.2	2.0	4.5	17.5	6.8
Metals and metal products (incl. automobiles)	72.1	1.4	0.8	1.8	2.4	13.6	7.9
Other manufacturing industries	67.5	3.2	0.9	1.4	2.1	21.3	3.6

* Includes depletion and losses on bad debts. Depletion is an appreciable item in two groups only: lumber and wood products (1.8 per cent) and chemicals (1.7 per cent).

these elements of costs of manufacturing corporations. While we have no data for single industries, we do have the ratios for major groups of industries (Table 21). Unfortunately, insufficient detail prevents the combination of the data into the capital-consumption goods division.

The major manufacturing costs are materials and the wages and salaries expended in fabricating them. Even so, these basic costs ranged in 1929 from but 60.6 per cent in corporations engaged in printing and publishing to 81.5 per cent in corporations making leather and leather products. Miscellaneous deductions are highest for the printing and publishing group and lowest for textiles and leather products. In all groups this miscellaneous item is large and must be examined further. Depreciation on fixed capital ranges from 1.1 per cent of compiled receipts for leather goods to 4.5 per cent for stone, clay, and glass products. Profits are lowest, as a percentage of receipts, for rubber products (0.8) and highest for the large metal and metal products group (7.9). These percentages should not be confused with rates of earning on investment. Rather they relate to sales, and in industries where the manufacturers' contribution is slight, relative to those producers who have preceded them in the productive process, the percentage of sales retained as net profit is likely to be small. It is low in industries where a high turnover means a low profit per unit of sale. Differences in these average rates of profits on sales obviously reflect losses suffered by some corporations within the group, and also the varying amounts of income received from non-manufacturing operations.[12]

[12] The entries in Tables 20 and 21 are percentages, not of sales, but of total receipts less tax-exempt dividends and interest received. Some part of the income received from other than manufacturing operations could be deducted from the total net profit figure in order to arrive at figures comparable with return on the gross sales of manufactured product. Gross profits other than from sales ranged from 10.7 per cent of total sales of chemicals to 1.9 per cent for leather products—amounts sufficiently large to explain much of the industrial difference noted in the profits ratio if we were sure there were no offsetting costs directly chargeable against these incomes.

Beginning in 1933, corporations were requested to report separately the cost of operations yielding a gross profit wherein inventories are not an income-determining factor. Prior to 1933 such costs, as determined by a slightly different definition of

Although in general, profits comprise the largest single item in the overhead plus profits total, they did not account in most groups in 1929 for as much as one-fifth of the total. Allowance for depreciation of capital equipment was an even less important item. As shown in Table 20, over half of what we have termed overhead other than salaries plus profits was unexplained by the reports to the Treasury.[13] We must look to sample studies of records of individual companies for further information on these unidentified expenses.

There are no studies of manufacturers' operating costs contemporaneous with the period we have been surveying. However, in 1934 a sample study of the 1933 experience was made by the Research and Statistical Division of Dun and Bradstreet, Inc.[14] Although the results are fragmentary and relate to a depression year, they yield some information on the relative magnitude of the items of overhead cost that now concern us.

This 1933 sample study of operating costs covered the records of 1,709 concerns in 58 manufacturing industries.

nonmanufacturing operations (the 1929 schedule refers simply to "operations other than . . . manufacturing"), were included among 'miscellaneous deductions'. In 1933 the ratio of these nonmanufacturing costs to the sum of these costs and the gross profit reported was .34; in 1934 it was .29. The bulk of the incomes (and costs) from nonmanufacturing operations occur in the printing and publishing, and chemical subgroups.

[13] Reports filed for operations in 1933 and 1934 indicate the magnitude of two items included among miscellaneous deductions in 1929. Rent paid on business property was 3.4 per cent of sales less cost of goods in 1933, 3.1 per cent in 1934. 'Cost of other operations' was 9.6 and 1.8 per cent of sales less cost of goods in 1933 and 1934 respectively, the high 1933 figure resulting chiefly from the method of reporting income in the printing and publishing group. In 1929 the amount spent for rent must be considerably below the 1933–34 figures since the dollar sales volume was much greater in 1929. As for 'costs of other operations', the similarity in the 1929 and 1934 ratios of 'income from other operations' to gross sales (.013 and .011 respectively as against .05 for 1933) suggest that 1.8 per cent is closer to the probable 1929 ratio than is 9.6 per cent.

The Treasury officials have at no time tabulated the various items reported under 'miscellaneous deductions'. In response to an inquiry it was suggested that the following items are included under 'miscellaneous deductions': "repairs, losses by fire, storm, etc., salaries and wages not elsewhere reported, stock that actually became worthless during the taxable year, general administrative and selling expense, and other overhead charges . . ." (a letter from the Assistant to the Director of Research and Statistics, U.S. Treasury Department, July 30, 1937). Being a miscellaneous group, all sorts of adjustments are probably incorporated in the item.

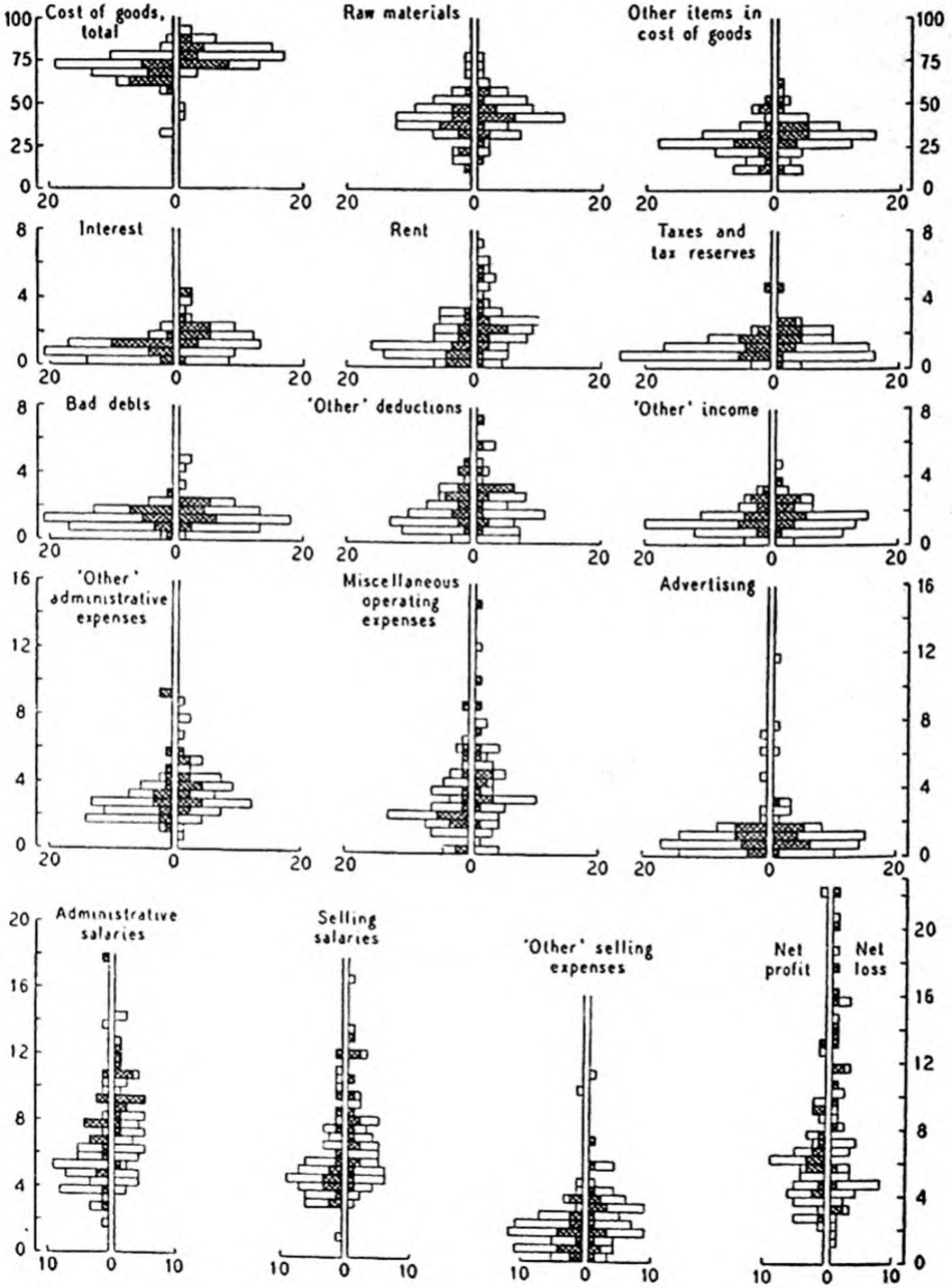
[14] *Manufacturing Survey, 1933* (Dun and Bradstreet, New York, 1934).

Chart I

EXPENSES OF MANUFACTURING COMPANIES, 1933

RATIOS OF ELEMENTS OF COST TO SALES IN 58 INDUSTRIES

Frequency distributions to the left of vertical relate to industry averages for concerns reporting profits, those to the right, concerns reporting losses. Shaded areas refer to capital goods industries. The horizontal scale relates to number of industries, the vertical scale to percentage of sales. The first three items are plotted with a smaller vertical scale than are the other items.



Their total net sales in 1933 were $824,440 thousand, which is roughly 3 per cent of the value of products reported by all manufacturing establishments in the Census of that year.[15] Of the 1,709 concerns included, 787 reported a net loss for 1933. Since separate figures are given for the concerns reporting net income and for those reporting losses, there are twice 58, or 116, sets of ratios of cost to net sales. Frequency distributions of these ratios (Chart I) suggest both the general magnitude of the factor considered and the variation from industry to industry. The chart indicates the different levels of the ratios for concerns making profits and those suffering losses,[16] as well as distinguishing between consumption and capital goods industries. The measures available for these sample industries are not exactly com-

[15] The 58 industries represented may be classified as follows: *Foods:* confectionery; dairy products; flour and feed; food products, canned goods and groceries; meats and meat products. *Textiles:* women's coats and suits; dresses; hosiery; men's clothing; men's furnishings; rugs and carpets; tents, awnings, and canvas; underwear and pajamas; upholstery and draperies; work clothing. *Lumber products:* building materials (wood); caskets; furniture; lumber; moldings and frames; wooden boxes; wooden specialties. *Paper products:* paper and paper products; paper boxes; stationery and office supplies. *Chemicals:* cosmetics; drugs; paint, varnish, and enamel. *Rubber products:* rubber goods. *Leather products:* leather goods; shoes; luggage. *Stone, clay, glass:* brick and tile; cement and concrete products; plate and window glass and mirrors. *Iron and steel products:* castings and forgings; furnaces and boilers; hardware; iron and steel products; plumbing and heating supplies; sheet metal; stoves and ovens; tools. *Nonferrous products:* cutlery and silverware; jewelry. *Machinery:* agricultural implements; electrical apparatus; electrical household apparatus; industrial machinery; miscellaneous machinery; refrigerators. *Transportation:* automobile parts and accessories; transportation machinery. *Miscellaneous:* brooms and brushes; fishing tackle; mattresses, springs and bedding; notions; scientific instruments. It will be noticed that most of the industries make finished products. Semifinished materials such as cotton goods, pig iron and steel, copper smelting, are inadequately represented. The petroleum and coke industries are not covered, nor are printing concerns and railroad repair shops.

The scope of the individual reports may exceed that of the Census of Manufactures, since the Census enumerators were instructed to exclude salaries of salesmen whenever the value of product could be determined for the manufacturing department alone. But if the value is as reported by the selling department, then all salesmen, whether on salary or commission, are covered in the Census reports.

[16] Each entry in the frequency tables upon which Chart I is based is an unweighted average for the varying number of concerns in the industry sample. Thus the 2 entries for the agricultural implements industry are averages for the 8 concerns that reported profits and the 27 concerns that reported losses. No attempt at weighting is made, either for the industry figures or for the frequency charts, but so far as different types of industry have significantly different ratios there is weighting proportionate to the relative number of such industries included in the sample. Since the average percentages are unweighted, their sum usually is not exactly 100.

parable with the Treasury data. Depreciation allowances are shown separately in the corporate returns, but are here included in 'cost of goods sold minus raw materials'.[17] While there is reason to believe that with this exception the item cost of goods sold is fairly comparable with the item of that name in the Treasury tabulations, we cannot be sure. If there is general comparability, then the item 'miscellaneous deductions' of the 1929 Treasury data should be approximately equivalent to the following groups recognized in the present survey: (1) advertising; (2) selling salaries, commissions, traveling; (3) other selling expenses; (4) rent; (5) administrative and office salaries (except officers' salaries); (6) other administrative expenses; (7) miscellaneous operating expenses; (8) all other deductions. Comparison with the 1933 Treasury figures, for totals only, is possible if we add rent to miscellaneous deductions from the 1933 Treasury reports (as was done in 1929) and secure a ratio of the total to gross sales. This ratio, 18.3 per cent, does not agree closely with the median of the distribution of the above listed items from the sample, 24.6 per cent, perhaps because of the character of the data. In any event, we must conclude that the median percentages relating to overhead costs drawn from the sample are on the whole somewhat higher than would be true for all manufacturing concerns.

The items of overhead disclosed by these sample figures in 1933 are chiefly salaries and other expenses. In most instances administrative salaries total more than selling salaries, although salesmen's expenses are included in the latter. Administrative salaries range from approximately 1.7 per

[17] Note also that the Treasury statistics include gross rather than net income from other operations in compiled receipts and the costs of these operations in miscellaneous deductions. The treatment of salaries and wages is probably the same in the sample and in the Treasury data. 'Cost of goods' as defined by the Treasury "includes salaries and wages only when shown specifically in item 2c [relating to cost of goods] on the face of the return. Salaries and wages which may be allocable to item 2c but which were reported elsewhere on the return were tabulated as 'miscellaneous deductions'" (*Statistics of Income, 1933*, p. 27). The 1929 Census schedule asked for the salaries paid "managers, superintendents, and other responsible administrative employees; foremen and overseers; clerks, stenographers, bookkeepers, and other clerical employees on salary". See also footnote 25, Ch. III.

cent of sales to approximately 17.6 per cent, with no pronounced concentration within these limits. Selling salaries and related payments vary as greatly, but tend to average less. The medians, calculated with equal weight given to profitable and nonprofitable concerns,[18] are 6.3 per cent for administrative salaries and 5.7 per cent for selling salaries. Together these salary payments account for over one-tenth of net sales. The cost of selling is perhaps higher for the concerns covered in this sample than for all manufacturing companies, since the industries represented are chiefly engaged in making finished goods, and costs of distribution, particularly 'selling' costs, are probably greater for finished products than for the semifinished goods sold in a relatively narrow market.

The cost of selling includes, of course, other expenses than salaries. Advertising costs are separated in our data. In almost every industry covered in the sample, less than 2 per cent of sales is spent for advertising purposes, the median expenditure being 1.0 per cent. For a few consumer goods in the sample, largely of the luxury class, the expenditure on advertising is high, particularly for drugs, cosmetics, and fishing tackle. These are 1933 figures, it must be remembered, and it is possible that more was spent on advertising in 1929. On the other hand, there has perhaps been a tendency to increased advertising effort on the part of manufacturers.[19]

[18] According to Treasury data, more than twice as many corporations reported no net income in 1933 as had net income. When gross sales are compared, however, this relationship is reversed, suggesting that the larger corporations continued to prove profitable even during depression years (cf. National Bureau *Bulletin 55*, Profits, Losses and Business Assets, 1929–1934). In smaller concerns, officers' compensation is frequently in lieu of profits, as is indicated by the large number of concerns that report losses every year.

[19] Additional information on manufacturers' advertising expenditures is to be found in the analysis of advertising budgets of cooperating companies made by the Association of National Advertisers, Inc., and the National Industrial Advertisers Association. From reports of 464 national advertisers (omitting 2 groups, financial and travel and transportation) the typical ratio of the 1929 advertising expenses to total sales volume was computed for 14 groups of consumers' products and 5 groups of industrial products, chiefly, though not exclusively, capital goods (*The Advertising Budget*, 1931, p. 15, and *An Analysis of 285 National Advertising Budgets*, 1932–33, pp.

'Other selling expenses' range higher than advertising costs, though below salaries. The median percentage is 2.2. An arbitrary addition of the three median percentages relating to selling cost gives 8.9 per cent as a rough measure of the extent to which receipts from sales were spent by the manufacturers in the sample in disposing of their goods.[20]

Overhead includes items of cost besides selling expenses. Administrative salaries have been mentioned. Rent is reported as requiring amounts ranging in some industries well over 3 per cent of 1933 sales, though the median percentage

128–29, Association of National Advertisers, Inc.). The ratios in the first group range from 21.2 per cent for drugs and toilet articles to 3.1 per cent for textiles; in the second group from 6.3 per cent for chemicals to 2.0 per cent for general industrial goods. Medians of the group averages for 4 years compare as follows:

Budgeted Advertising Expense as Percentage of Net Sales

	1929	*1930*	*1932*	*1933*
Consumer advertisers				
14 industrial groups	4.4	4.6	..	..
24 industrial groups	..	..	5.9	5.6
Industrial advertisers				
5 industrial groups	2.6	2.8	..	..
9 industrial groups	..	..	3.1	3.2

The annual *Survey of Industrial Advertising Budgets* of the National Industrial Advertisers Association gives 2.3 per cent of sales as the average expenditure on advertising of industrial products in 1929.

Examination of these various surveys results in the conclusion that variation in expenditure is about as indicated by the Dun and Bradstreet sample, with the same industries showing heavy advertising expenditures, and consumers' goods industries spending more than those making industrial products. No marked changes from year to year are visible, but the selection favors companies maintaining their advertising program. Thus the 1932–33 survey of the National Advertisers Association is based on 257 returns, whereas 72 additional concerns reported that their advertising expenditures had been either drastically reduced or discontinued entirely. On the whole, the concerns here represented are considerably larger than those reported in the text, and the greater average expenditure on advertising may well be the result, since small concerns cannot enter the national field. That the surveys cited were focused on advertising alone is another reason for the higher averages, for probably certain items are included in the advertising budget that would be classified elsewhere in other studies.

[20] This figure stands in contrast with a median of 11.8 per cent (unweighted arithmetic average: 9.4 per cent) of sales spent for distribution expenses in 1935 as reported by manufacturers to the Bureau of the Census (*Distribution of Sales of Manufacturers, 1935*, pp. 23 ff). Approximately 40 per cent of all manufacturers reported distribution expenses for 1935. Total payroll expenses accounted for 4.1 per cent and other distribution expenses 5.3 per cent of total sales. How closely these figures parallel the 1929 (or 1933) experience we have no way of telling. They do indicate no greater distribution expenses, relative to sales, for manufacturers of consumption goods

is 1.8. Since 1933 the Treasury Department has reported 'rent paid on business property' in addition to the items of Table 20. For all manufacturing corporations this item

than for manufacturers of capital goods. This conclusion is evident in the frequency distributions based on the reported industry ratios.

	Percentage of Sales							
	0–4.9	5–9.9	10–14.9	15–19.9	20–24.9	25–29.9	30–34.9	Median
All Industries	35	90	96	52	31	7	1	11.8
Consumption goods industries, total	29	69	78	42	23	4	1	11.6
Selected industries, total distribution expense	6	25	34	13	6	1	1	11.8
Payroll	37	44	5	..	..	..	..	5.7
Other distribution expense	24	52	7	3	..	..	..	6.9
Capital goods industries, total	6	21	18	10	8	3	..	11.8
Selected industries, total distribution expense	2	9	7	1	2	1	..	10.4
Payroll	14	6	1	1	..	..	..	4.1
Other distribution expense	11	10	..	1	..	..	..	5.2

A survey of the operating costs of 90 manufacturers in Minneapolis, St. Paul, and Duluth shows sales expense to have increased from 10.9 per cent of sales in 1926 to 13.3 per cent in 1930 (*Operating Results of Manufacturing Plants in Minnesota, 1926–1930*, University of Minnesota Employment Stabilization Research Institute, December 1932). In 1929 selling expenses averaged 11.8 per cent of sales, with considerable variation among the types of concern represented. In the order of the number of concerns covered, the 1929 percentages are: machinery and metal products, 9.3; wood products, 5.4; foods, 9.7; miscellaneous, 18.6; paper and printing, 15.3; textiles, 11.5.

Another survey, *An Analysis of the Distribution Costs of 312 Manufacturers*, conducted by the Association of National Advertisers with the cooperation of the National Association of Cost Accountants, reports that for 19 groups of industries making consumers' products (chiefly consumption goods) in 1931, total costs of distribution ranged from an arithmetic average of 38.8 per cent of net sales for the drugs and toilet articles group to 16.5 per cent for radio equipment and supplies. The median was 26.4 per cent. The median percentage of sales for direct selling costs (salaries, commissions, etc., traveling expenses, office expenses) was 11.3; advertising and sales promotion, including salaries, 6.0; transportation costs, 1.3; warehousing, 0.9; credit and collection expense, 1.2. The median percentage for total distributive costs of the 10 industry groups making industrial products was 19.8; for the largest group, machinery and machine tools, 25.8. The median for direct selling costs was 10.1 per cent; advertising and sales promotion, 2.2 per cent; transportation costs, 1.5 per cent; warehousing, 0.7 per cent; credit and collection expense, 0.8 per cent. The average size of the reporting companies is large, 78 of the 312 concerns having sales of over $5 million. There is no clear evidence in the survey, however, that larger concerns had higher or lower distributive costs in proportion to their sales. The differences between these figures and those of the text and for Minnesota just cited may lie in the peculiarities of the several samples (see preceding footnote). In view of the fair agreement between the sample figures discussed in the text and the Treasury and Census data it does not seem that the high distributive costs here suggested could be generally representative.

amounted to 0.9 per cent of gross sales in 1933. Though this is below the average for our sample, the magnitudes are of the same general order.[21]

Two miscellaneous items, 'other administrative expense' and 'miscellaneous operating expense', each account, on the average, for about 3 per cent of sales. There is of course wide variation in these ratios and the significance of any average derived from them is correspondingly reduced. The same may be said of the concluding expense item, labeled simply 'other deductions'.

If all the items of overhead cost are combined, the median value is 28.1 per cent of sales (the sum of the medians for the 11 individual items is 28.5).[22] The order of importance of the components of overhead (but with depreciation charges excluded) is as follows: (1) administrative and office salaries; (2) selling salaries, commissions, traveling; (3) miscellaneous operating expenses; (4) other administrative expenses; (5) other selling expenses. These are followed by a group of expenses with medians ranging between 1.8 and

[21] The following comparison between the Treasury and sample data is possible, though inexact.

	Percentage of Sales		
	Treasury returns		Sample (median)
	1929	*1933*	*1933*
Interest	1.0	1.4	1.1
Rent	..	0.9	1.8
Bad debts	0.4	1.0	1.3
Federal income tax	0.8	0.6	1.2
Other taxes	0.9	2.9	
Net profits, before tax			
Corporations reporting net income	+ 9.1	+ 7.1	+ 5.8
Corporations reporting no net income	— 6.8	— 10.6	— 6.9

[22] The simple median for cost of goods as a percentage of sales is 74.3. This figure and 28.1 sum to more than 100, but offsetting a part of the excess is the credit item 'other income', whose median percentage of sales is 1.4. There remains no balance for profits, but since the median loss exceeded the median gain (+ 5.8, — 6.9) this conclusion is not inconsistent with the sample totals. Rough averages of course cannot be relied upon to give perfect agreement of all the parts and, as was pointed out earlier, such internal consistency does not hold true for the basic industry averages.

The ratio of these overhead items to gross sales based on 1933 Treasury statistics is 24.9 per cent; including depreciation charges it is 29.9. The residual group, overhead costs plus profits from the Census returns, which include depreciation charges, was 29.6 per cent of sales in 1933 when all salaries are included, 25.3 when salaries are excluded.

1.0 per cent: rent, bad debts, taxes, advertising, interest, and other deductions.[23]

The division of the 58 industries into capital and consumption goods subgroups reveals no striking differences, as examination of Chart I indicates. Of course, the sample is not large, and its behavior becomes more erratic as we examine subgroupings. Cost of materials are relatively less in the capital goods group but, in general, no clear differences are apparent. Approximately the same relative amount seems to be spent by manufacturers on sales effort—advertising and selling salaries—in both sections of the sample. The comparison suggests that manufacturers of capital goods have at least average distributive costs. This conclusion is supported by the 1935 Census figures on distribution expenses of manufacturers, though several sample studies indicate that in capital goods industries distributive costs are considerably below those encountered in consumption goods industries.[24]

The evidence provided by this analysis of the operating expenses of 1,709 manufacturing concerns in 1933 can hardly be accepted as definitive. The ratios do help to indicate the approximate importance of the different overhead cost elements but the qualifications imposed by the character of the data should not be overlooked. Where comparison is possible, the ratios agree fairly well with similar measures based on the all-inclusive data of the Census of Manufactures and the Treasury Department. But until we have complete information on the magnitude of these overhead costs of manufacturers, we must rely on sample surveys. The present figures have the merit of suggesting the importance of selling and administrative expenses in what we term 'overhead plus profits' indicating that, even at the manufacturing stage, the productive system starts to build up the distribution costs

[23] Also included among residual costs in the 1929 Census is the cost of mill or shop supplies (lubricating oil, minor replacement parts) reported at earlier Censuses with materials.

[24] See footnotes 19 and 20. The 1935 Census findings are summarized in footnote 20.

that bulk so large by the time the goods reach ultimate consumers.

USE OF LABOR AND CAPITAL IN MANUFACTURING OPERATIONS, 1929

Wage earners and salaried employees

Preceding sections have indicated something of the importance of wage and salary costs in manufacturing. This section compares certain direct measures of labor's role in manufacturing operations. Table 22 shows, for 1929, the relative importance of wage and salaried employees in the manufacture of different types of goods, and presents averages of the value of product and value added per wage earner. Salaried employees [25] of manufacturing industries comprise, in the aggregate, approximately 15 per cent of all wage earners employed. The proportion is somewhat higher in industries making consumption goods and producers' supplies, and somewhat lower in the capital goods and construction materials industries. In industries making finished products there are relatively more salaried employees than in industries at earlier manufacturing stages. The finished consumption goods industries employ relatively more salaried workers than do the finished capital goods industries,

[25] 208,363 salaried employees working in central administrative offices of manufacturing corporations are not included in the present discussion since they are not classified by industries. Neither their number nor their salaries ($600,437,000 in 1929) have been included in the Census totals since 1921.

The Bureau of the Census bases its classification of salaried employees on the character of the work done. On this point the *Instructions for Preparing Manufactures Reports*, Census of Manufactures, 1929, read as follows (p. 36): "No person should be reported as a salaried employee merely because he is hired by the week or month instead of by the day. The distinction should be based primarily upon the character of work done rather than upon the unit of time which is the basis of compensation. Wage earners are not confined to those who receive day wages, although most wage earners are paid on this basis. It will doubtless be found, for instance, that engineers and firemen in mills and pressmen in newspaper offices are often employed by the week or the month, but they should be classed as wage earners rather than as salaried employees. Time keepers, messenger boys, etc., in printing establishments, and the like, whose work is closely related to that of persons who would ordinarily be called clerks, stenographers, and salesmen may be classed as salaried employees. Drivers on delivery wagons and newsboys or carriers should not be included in the reports."

All data on salaried employees relate to December 1929; the data on number of wage earners are averages for the year.

but this relationship is reversed in the unfinished goods division. The highest percentage of salaried employees is in the transient goods group of the classification according to durability in ultimate use. In this group salaried employees were about one-fourth of the number of wage earners, in sharp contrast to the 10 per cent ratio in the semidurable goods group.

Table 22

The Role of Wage Earners in Manufacturing Production, 1929

Economic Group	Salaried Employees as a Percentage of Wage Earners	Value of Product per Wage Earner	Value Added per Wage Earner [1]
Classification based on Ultimate Use			
Consumption goods	15.9	$8,674	$3,743
Capital goods	14.3	6,529	3,309
Construction materials	13.7	6,644	3,310
Producers' supplies	16.9	9,195	3,955
All manufactures	15.4	7,969	3,607
Classification based on Stage of Manufacture and Ultimate Use			
Finished goods, total [2]	17.1	8,159	3,797
Consumption goods	18.2	9,314	4,088
Capital goods	15.4	5,633	3,228
Unfinished goods, total [2]	11.9	7,578	3,218
Consumption goods	10.8	7,245	2,973
Capital goods	12.7	7,951	3,438
Classification based on Durability in Use			
Durable goods, total	14.0	6,957	3,423
Capital and construction goods	14.0	6,461	3,304
Consumption goods	13.9	8,090	3,695
Semidurable goods	10.0	5,958	2,686
Transient goods	24.7	12,489	5,085

[1] Value added by manufacture is used as a measure of manufacturing output and represents the contribution of all productive factors in manufacturing operations. Value added per wage earner does not measure the value imputed to manufacturing labor alone.

[2] Includes construction materials and producers' supplies.

Greatest sales (value of product) per wage earner, in the first classification of Table 22, are in the producers' supplies group; the consumption goods group is second. Finished goods industries have larger per capita sales than unfinished goods industries, as might be expected from the higher unit value of their product. The ratio is relatively low for finished capital goods, but this reflects the heavy labor requirements of these industries.

Classified according to durability of product, sales per wage earner are heaviest in the transient goods group. In fact, the ratio for this group exceeds all others in Table 22. Even if the number of salaried employees and of wage earners are combined, in recognition of the importance of salaried employees in this group, the average per capita sales for the transient group is still exceptional. In view of the high material costs as well as high overhead costs in these transient goods industries, this result might be expected, since where material costs are high, relatively more of the labor participation in production has taken place at a prior stage. But even when we exclude the prior stages of production in comparing the value added by manufacturing operations with the number of manufacturing wage earners, the transient group continues to show a striking per capita value. The lowest ratios are for the semidurable goods group—again as might be expected. Per capita product tends to be low when labor is a relatively important factor (in terms of magnitude of the items) in the operations, and to be high when the capital factor (embodying previous labor) assumes a relatively larger share of the production load. For this reason it is necessary to consider the use of labor in relation to the capital investment in manufacturing. Before turning to the consideration of the capital factor, however, let us examine the extent of industrial variation in the relative importance of wage and salaried employees.

Two manufacturing industries, both in the printing and publishing group (newspaper and periodical, and music pub-

lishing), employed more salaried workers than wage earners in 1929. In 11 industries the ratio of salaried employees to number of wage earners was over one-half (see Table 23).

Table 23

Salaried Employees as a Percentage of Wage Earners, 1929

326 Manufacturing Industries

Ratio of Salaried Employees to Wage Earners (per cent)	Number of Industries [1]		
	All industries	Consumption goods	Capital goods
0.0– 4.9	2	2	..
5.0– 9.9	55	44½	10½
10.0–14.9	71	54	17
15.0–19.9	79	60	19
20.0–24.9	49	42½	6½
25.0–29.9	25	17	8
30.0–34.9	18	9	9
35.0–39.9	5	5	..
40.0–44.9	3	3	..
45.0–49.9	8	6	2
50.0–54.9	2	2	..
55.0–59.9	3	3	..
60.0–64.9	1	1	..
65.0–69.9	..	..	..
70.0–74.9	..	..	..
75.0–79.9	..	..	..
80.0–84.9	2	2	..
85.0–89.9	..	..	..
90.0–94.9	1	1	..
115.2	1	1	..
174.5	1	1	..
Median (per cent)	17.2	17.2	17.3
Average deviation	8.7	9.2	6.9

[1] Two industries, lumber and electrical machinery, are entered in both the consumption and capital goods classifications, with half weight.

The median relationship of wage earners and salaried employees for industries making chiefly consumption goods is

17.2 per cent; capital goods, 17.3 per cent. These unweighted figures compare with ratios of 15.9 per cent and 14.3 per cent derived from the estimates of total number of workers of both classes in operations leading to the manufacture of these goods. The discrepancy between the weighted averages based on total figures and the medians of the unweighted distribution (the unweighted averages are even higher than the unweighted medians) suggests that salaried employees are less numerous, relatively, in the larger industries.[26]

The role of capital in manufacturing production

We have estimated that approximately $50 billion was invested in manufacturing enterprises in 1929.[27] In relation to manufacturing production of that year, as measured by value added by manufacture, capital was equivalent to about 18 months' output. In relation to sales, the annual capital turnover was 1.4 times. The average over-all investment per wage earner was $5,680. Measures of this sort are indicative of the role of capital in the manufacturing structure. We turn now to a consideration of the industrial differences that an examination of such measures reveals.

Ratio of capital to sales

The estimates of total invested capital utilized in manufacturing different kinds of goods and the comparable totals of

[26] The ratios of salaried workers to wage earners (in percentages) for the largest 20 industries of 1929 are given below. The median for this subsample (11.3 per cent) is indeed less than the median for the full group of all industries, although the distribution is marked by wide extremes.

Cotton goods	3.3	Motor vehicles	12.0
Lumber and timber products	5.6	Furniture	12.7
Knit goods	6.7	Clothing, women's	14.8
Steam railroad repair shops	8.1	Petroleum refining	17.1
Cigars and cigarettes	8.7	Meat packing	19.1
Motor vehicle bodies and parts	9.0	Foundry and machine shop products	19.3
Steel works and rolling mills	9.4	Electrical machinery	23.1
Boots and shoes	9.5	Printing and publishing, book and job	31.5
Clothing, excl. work, men's	10.5		
Bread and other bakery products	11.2	Printing and publishing, newspaper and periodical	115.2
Paper	11.4		

[27] See Ch. I and II and especially Ap. VI. Note the reasons there given for not including accounts receivable among total capital assets.

value of products, discussed in Chapter II, provide ratios of capital to sales (Table 24).

Relative to value of product, the capital investment in manufacturing industries varies rather widely according to the type of product. It is relatively high in industries making

Table 24

Capital Investment as a Percentage of Value of Product, 1929

Manufacturing Industries classified according to Ultimate Use of Product

Ultimate Use	Fixed Capital	Circulating Capital	Total Capital*
Consumption goods	31.9	22.5	64.4
Capital goods	38.8	24.2	70.1
Construction materials	60.1	26.0	95.0
Producers' supplies	53.9	22.7	91.9
All manufactures	38.3	23.2	71.3
Consumption goods			
Foods	28.3	18.9	56.1
Wearing apparel, etc.	26.5	25.4	59.3
Household goods	38.4	27.1	75.0
Transportation			
Motor cars	28.0	20.5	53.2
Supplies and other	65.8	28.1	107.5
Publications	34.2	13.6	68.3
Fuel, mfd.	55.1	28.4	117.3
Other	45.6	35.1	113.8

* Includes miscellaneous assets; cf. Ap. VI.

construction materials and producers' supplies. It is relatively low in industries making capital goods. The fabrication of consumption goods requires, on the whole, even less capital per dollar of product. Only certain types of consumption goods, particularly transportation supplies (chiefly tires and petroleum products), manufactured fuels, and miscellaneous consumption goods, show relatively high ratios of total capital

to sales. Circulating capital—cash and inventories—is not a widely differing percentage of sales among the larger groups. Among the subgroups of consumption goods, the publications, food, and transportation subgroups have low, and the miscellaneous group high, ratios of circulating capital to sales. Fixed capital, for larger subgroups, is relatively highest in the transportation supplies and household goods groups. In examining the measures of fixed capital it should be remembered that the basic corporation figures often include assets not directly associated with manufacturing operations, particularly holdings of various natural resources. Evidence of such holdings is found in the charges for depletion included in the tax returns by manufacturing corporations. The groups most affected appear to be lumber and petroleum products; accordingly the high ratios for construction materials and producers' and transportation supplies of Table 24 must be somewhat discounted.

Approximate division of the capital estimates into the groups just summarized has been possible despite the broad industrial classification of the corporate tax records. Unfortunately we can learn little or nothing of the detail behind these totals, nor can we make other combinations of the data. Moreover, the difficulties that arise from the necessity of adapting figures from corporate balance sheets to the limits of the Census of Manufactures definition of establishment and industry make it well to seek elsewhere for additional information on the use of capital in manufacturing operations.

In each census year through 1919 information on capital invested was collected as a part of the Census of Manufactures. These figures were not reported after 1919 because it was believed that difficulties of definition led manufacturers to varying interpretations of the scope of the question on investment and, more disturbing, that the inadequacy of their records frequently made the responses little more than guesses. Because of these defects, and because of changes in

capital structure since 1919, little use can be made of the early census data on capital investment. Total capital reported for manufacturing in 1919 was $44.5 billion; total value of products was $62.4 billion, and value added by manufacture, $25.0 billion. The ratio of capital to sales was 71.2 per cent.[28]

In two important industrial states, Massachusetts and Pennsylvania, the state authorities have continued to compile data on capital investment in manufacturing establishments. The figures are probably more reliable than were those for all manufacturing in 1919, because of continued efforts to improve their collection. Moreover, largely as a result of prodding by the federal corporate tax authorities, business men now keep more adequate records.[29]

The estimates for Massachusetts are available for even-numbered years since 1920, and data for 1928 have been used as an approximation to the situation existing in 1929.

[28] Instructions to those taking the 1919 Census were to report capital actually invested whether owned or borrowed, but to exclude that rented. Liabilities were not to be deducted and charges were to be made for depreciation only if they appeared on the books of the concern. Value of 'good will' and of patent rights was to be excluded wherever possible. Estimates were to be made whenever an enterprise reported both manufacturing and nonmanufacturing activities, yet gave a single figure for capital investment.

[29] On the other hand, the increasing integration of industry and the spread of the enterprises' activities beyond state boundaries must mean that many difficult problems of estimation have had to be faced in getting state totals. The Massachusetts inquiry is identical in wording with that formerly used in the federal census asking for ". . . the total amount of capital, both owned and borrowed, on the last day of the business year reported. All the items of fixed and live capital may be taken at the amounts carried on the books . . ." Both the value of rented properties and the value of securities and loans representing investment in other enterprises are excluded. The data are reported (though not published) under four headings: land, buildings, and fixtures; machinery and tools; materials, stocks in process, finished products, fuel and miscellaneous supplies; cash, accounts receivable, and sundries (Form M–1). Special compilations for 1928 discussed below indicate the importance of these different capital items. See also the preceding footnote for special instructions relating to the old federal schedules which doubtless continue to apply to the Massachusetts inquiry. Since no state census is taken in years covered by the federal census, no comparison of coverage is possible.

The Pennsylvania questionnaire instructs manufacturers to report the "amount of money actually invested in plant and equipment. Include value of land used in connection with plant" (Form S–1). It will be seen that the capital reported in the Pennsylvania Census is rather narrowly defined, omitting as it does all circulating capital as well as the intangibles excluded in the federal and Massachusetts inquiries. Accordingly, the absolute level of the ratios here given is somewhat lower than it would be were a more inclusive definition of capital adopted. In 1919 the capital invested in manufactures in Pennsylvania was reported as less than $4 billion in the state census, over $6 billion in the federal census. No similar comparison is available for Massachusetts for the reason noted above.

The Pennsylvania data are reported annually, and therefore are available for 1929. These two states contributed approximately one-sixth of the value added by all manufacturing operations in the United States in 1929; in 1919 they ac-

Table 25

Relation of Capital Investment to Sales

200 Manufacturing Industries, Massachusetts, 1928, and Pennsylvania, 1929

Capital as a Percentage of Sales [1]	Number of Industries [2]		
	Total	Consumption goods	Capital goods
0.0— 9.9	..	..	..
10.0— 19.9	3	2	1
20.0— 29.9	8	6	2
30.0— 39.9	20	19	1
40.0— 49.9	31	27	4
50.0— 59.9	27	23	4
60.0— 69.9	28	21	7
70.0— 79.9	19	15	4
80.0— 89.9	23	18½	4½
90.0— 99.9	8	5	3
100.0—109.9	9	5	4
110.0—119.9	2	1	1
120.0—129.9	6	4	2
130.0—139.9	4	4	..
140.0—149.9	2	1	1
150.0—159.9	4	2	2
160.0 and over [3]	6	3½	2½
Total	200	157	43
Median (per cent)	64	61	76
Average deviation	25	24	30

[1] See footnote 29, Ch. III, for definitions of capital used in the Massachusetts and Pennsylvania state censuses.
[2] The division of the 200 industries into the capital-consumption goods groups parallels the similar division of the 326 industries of the federal census, cf. Ap. I. Two industries, lumber and electrical machinery, are placed with half weight in each group. Most construction materials are classed with capital goods.
[3] These industries are: lumber (165); locomotives (165); fertilizer (182); textile machinery (197); manufactured gas (229); ice (287).

counted for one-fifth of both total capital investment and total value added. Since the states are the older centers of industrial activity, there may be some bias in the figures on capital. This bias, in relation to the other states, would be present if there has been considerable writing off of capital assets, or if the capital has been fully offset by depreciation charges though remaining in use. It is probably true also that the fixed capital in these states is, on the average, older than in the country as a whole, and the reported values are therefore more heavily weighted by the price levels of the earlier years.

Of the 200 industrial comparisons between sales and capital investment based on the Massachusetts and Pennsylvania censuses only 33 showed the investment to exceed annual sales in the years studied (Table 25).

The industry ratios vary from less than 0.2 to over 2.8, which means that in some industries capital was less than 20 per cent of annual sales, and in one industry, ice manufacture, the capital invested was over 280 per cent of sales. Most of the ratios are less than 1, the median being .64 (i.e., 64 per cent).

The variations evident in the general distribution persist when groups of industries making capital and consumption goods are formed, although the scatter is much more pronounced in the ratios for capital goods industries. (This group here includes the major construction materials.) In general the tendency is for higher values of the ratio in the capital goods group, as is suggested by a median of 76 per cent as against 61 per cent for consumption goods. These unweighted measures agree fairly well with the average ratios of Table 24, particularly since the present group of capital goods includes the major construction materials with their relatively high capital ratios.

A clue to the source of some of the industrial variation may be found in an examination of particular industry fig-

ures. Differences in the general level of the ratios for these different industry groups are indicated in Table 26.

Among the industrial groups with relatively high ratios of capital to sales are petroleum and coke, stone, clay, and

Table 26

Relation of Capital Investment to Sales, by Broad Industrial Groups

Massachusetts, 1928, and Pennsylvania, 1929

Industrial Group	No. of Industries	Capital as a Percentage of Sales: Average (weighted)	Capital as a Percentage of Sales: Median (unweighted)	Measure of variation [1] (per cent)
Dominantly consumption goods				
Foods	18	55.0	52.5	44.8
Textiles	32	65.8	47.6	93.6
Leather and leather products	8	44.3	46.1	57.3
Paper and printing	15	75.8	57.3	47.5
Chemicals	19	64.9	56.9	49.3
Petroleum and coke	4	106.4	148.4	..[2]
Rubber goods	2	72.7	73.8	..[2]
Dominantly capital goods				
Stone, clay, and glass	12	108.3	83.6	35.3
Lumber and timber products	14	74.2	70.2	63.5
Iron and steel	20	62.8	78.6	50.4
Nonferrous metal products	14	56.5	56.6	28.8
Machinery	10	93.5	102.1	29.0
Transportation equipment	9	62.8	68.6	55.5
Total[3]	200	..	64.1	62.7

[1] The interquartile range (the range of the mid-half of the items) as a percentage of the median.
[2] Not computed because of small number of industries.
[3] Includes 23 industries classed as miscellaneous.

glass, machinery, rubber, and lumber and paper products. The ratio is low in foods where, as we have seen, raw material is the principal item of cost. It is low in the leather and textile groups where the labor and material costs are high. There is considerable variation, however, within each group, as the measures in the last column of the table show. In textiles particularly there are wide variations. The primary processes of textile manufacture, such as the spinning and weaving of cotton and woolen cloth, require extremely heavy investment. In the manufacture of final textile products, clothing in particular, the ratio is low, because of the greater importance of labor (and of materials) in the final selling price. There is wide variation in this textile group, as is shown by a range of the central half of the ratios almost equal in size to the median (93.6 per cent). This device of comparing the range of scatter with the median affords some comparison of groups and the total. In two groups, textiles and lumber products, the measure of variation is greater than for the total of all industries considered together. In two groups the measure is relatively low: nonferrous metals and products and machinery. But even here the variation is considerable.

Approximately the same extremes and much the same industrial ranking are found when we examine the ratio of capital to sales for 73 groups of large corporations (Table 27).[30] The highest ratio is in the 11 concerns manufacturing beverages for the full period 1919–28, when the capital investment (here measured as capitalization) averaged over twice annual sales. At the other extreme is meat packing with a ratio of .2, and flour with a ratio of .3. The ratio for meat packing is low partly because the greatest portion of the sales price goes for material, but also because of the natural obstacles to mechanization. In beverages, on the other hand, there is a high degree of mechanization, and also great investment in inventory and in goodwill. These factors affect

[30] Based on data for 2,046 manufacturing corporations analyzed by R. C. Epstein in *Industrial Profits in the United States* (National Bureau of Economic Research, 1934). A definition of capital somewhat narrower than that we have adopted is employed.

Table 27

Ratio of Capitalization to Sales

Selected Manufacturing Corporations, United States *

Industry	No. of Corporations	1928	1919–1928
Dominantly consumption goods			
Beverages	11	1.8	2.2
Petroleum refining	52	1.6	1.3
Misc. chemicals	26	1.6	1.4
Ceramics	48	1.6	1.4
Blank paper	35	1.4	1.2
Pianos	11	1.3	1.0
Crude chemicals	9	1.3	1.2
Weaving woolens	31	1.2	1.0
Carpets	18	1.1	0.9
Book and music publishing	17	1.1	0.9
Proprietary preparations	56	1.1	0.9
Confectionery	21	1.0	0.8
Cotton weaving	49	1.0	0.9
Misc. paper products	23	1.0	0.8
Firearms	11	1.0	1.0
Misc. metal products	45	1.0	1.2
Misc. food products	27	0.9	0.8
Misc. textiles	54	0.9	0.7
Job printing	46	0.9	0.8
Hardware	40	0.9	0.8
Toys	12	0.9	0.8
Silk weaving	17	0.8	0.7
Cotton converting	18	0.8	0.7
Furniture (non-metal)	55	0.8	0.8
Cardboard boxes	33	0.8	0.6
Stationery	20	0.8	0.9
Paints	42	0.8	0.7
Jewelry	24	0.8	0.7
Toilet preparations	9	0.8	0.6
Misc. special mfg.	43	0.8	0.7
Baking products	17	0.7	0.7
Canned goods	16	0.7	0.7
Tobacco	23	0.7	0.7
Cotton spinning	12	0.7	0.6
Men's clothing	25	0.7	0.7
Knit goods	42	0.7	0.6
Boots and shoes	25	0.7	0.6
Misc. lumber products	28	0.7	0.6
Newspapers and periodicals	20	0.7	0.8
Misc. printing and publishing	17	0.7	0.6
Misc. clothing	23	0.6	0.5
Misc. leather products	29	0.6	0.6
Rubber products	26	0.6	0.7
Dairying	26	0.5	0.3
Cleaning preparations	16	0.5	0.5
Motor vehicles	32	0.5	0.6
Package foods	19	0.4	0.4
Flour	32	0.3	0.3
Meat packing	23	0.2	0.2
Dominantly capital goods			
Railway equipment	25	2.1	1.2
General factory machinery	23	1.9	1.9
Engines	11	1.9	1.5
Portland cement	21	1.8	1.5
Textile machinery	18	1.7	1.3
Printing machinery	12	1.5	1.5
Lumber manufacture	64	1.5	1.5
Castings and forgings	99	1.3	1.2
Tools	30	1.2	1.3
Misc. stone and clay products	27	1.1	0.9
Millwork	17	1.1	1.0
Wire and nails	20	1.0	0.9
Heating machinery	42	1.0	0.9
Office machinery	13	1.0	0.9
Misc. machinery	32	1.0	1.0
Scientific instruments	23	1.0	1.0
Planing mills	26	0.9	0.6
Glass	18	0.9	0.7
Electrical machinery	54	0.9	0.9
Road machinery	22	0.9	0.8
Mining machinery	12	0.9	0.8
Bolts and nuts	15	0.9	0.9
Sheet metal	20	0.8	0.8
Nonferrous metals	48	0.8	0.9
Total	2,046	0.9	0.8

* The ratios are based on compilations of the records of 2,046 large manufacturing

the ratio in varying combinations and help to explain its wide variations. Differences between these and similar measures in preceding tables are partly to be explained by unlike definitions of capital.[31] The figures of Table 27 rest on estimates excluding funded debt.

Table 27 provides a ready comparison of the ratios of capital to sales at the end of the post-War decade with the average standing for the decade. These ratios seem to be strikingly stable, despite modifications introduced by varying conditions of prosperity, by changing price levels, and by changing capital investment. Unfortunately we do not have measures indicating the variation over the decade, and it may be only by chance that the 1928 ratios approximate the average standing as closely as they do. In 19 industries the average and the 1928 ratios are identical; in all save one or two instances they are quite similar. The average deviation is but 15 per cent of the average 1928 ratio. In general the 1928 ratio is above the average for the decade ending in 1928. This is in accord with the trend toward greater capital investment and lower prices of manufactured goods that marked the post-War period.

Ratio of capital to value added

For certain purposes, comparisons of capital investment with some nonduplicating item such as 'value added' are prefer-

corporations analyzed by R. C. Epstein in *Industrial Profits in the United States* (National Bureau of Economic Research, 1934). The figures here presented are computed directly from the original data. 'Capital' as used in these ratios is stockholders' equity and therefore excludes funded debt. Since funded debt is relatively small in most manufacturing industries, Dr. Epstein believes its inclusion would not modify the ratios appreciably. (He estimates for all manufacturing corporations total capitalization thus defined at $53.9 billion in 1928, total capital at $59.8 billion. Total sales were $64.4 billion, the ratio of total capital to sales being .93.) As they stand, these sample ratios average considerably above the ratios for the two states shown in Table 25. This may be because of the narrower definition of capital in the state reports, particularly Pennsylvania (see footnote 29), special conditions in these states causing the ratios to be low, and the fact that Dr. Epstein's sample comprises for the most part large corporations and relates to 1928, when sales were below the 1929 levels. The data are inadequate, however, to test the relation of size of enterprise to the ratio of capital to sales.

[31] See Epstein, *op. cit.*, Ch. 45, The Valuation of Assets: Capitalization Problems, for a discussion of problems associated with this topic.

able to the familiar ratio 'sales to capital', or its reciprocal, 'capital as a percentage of sales'. Accordingly we turn our attention to ratios of this sort for the various capital-consumption goods divisions of the capital estimates based on the corporation records of the United States Treasury Department (Table 28).

Table 28

Capital Investment as a Percentage of Value Added, 1929
Manufacturing Industries classified according to Ultimate Use of Product

Ultimate Use	Fixed Capital	Circulating Capital	Total Capital*
Consumption goods	74.0	52.2	149.2
Capital goods	76.6	47.8	138.4
Construction materials	120.7	52.2	190.7
Producers' supplies	125.2	52.8	213.6
All manufactures	84.5	51.3	157.5
Consumption goods			
Foods	88.7	59.1	175.6
Wearing apparel, etc.	57.7	55.4	129.2
Household goods	73.6	51.9	143.8
Transportation			
Motor cars	70.4	51.5	133.6
Supplies and other	202.6	86.4	331.0
Publications	47.7	19.0	95.3
Fuel, mfd.	114.4	58.9	243.6
Other	68.3	52.6	170.4

* Includes miscellaneous assets; cf. Ap. VI.

As the base of the ratios is shifted from value of product to value added, the apparent relative importance of capital in the consumption goods industries is increased. Of the four major groups, capital goods have the lowest ratio of capital to value added, though for fixed capital alone the ratio is slightly above the ratio for the consumption goods total. Among the subgroups of consumption goods it is in the fuel

and transportation supplies groups that the role of capital is relatively most important, though again the ratios must be discounted somewhat because of nonmanufacturing investments.

Turning once more to the state census data for detailed ratios, we have for Massachusetts [32] the comparisons of Table

Table 29

Ratio of Capital Investment to Value Added, Massachusetts, 1928

Selected Manufacturing Industries *

Industry	Ratio of Capital to Value Added	Value Added as a Percentage of Value of Product
All manufactures	1.8	48
Dominantly consumption goods		
Cotton goods	3.4	44
Woolen and worsted goods	2.9	38
Paper and wood pulp	2.8	43
Dyeing and finishing textiles	2.3	38
Leather, tanned, curried, and finished	1.8	35
Rubberized goods, incl. tires	1.6	41
Printing and publishing	1.0	69
Boots and shoes, other than rubber	0.9	47
Bread and other bakery products	0.7	50
Dominantly capital goods		
Textile machinery and parts	2.9	68
Cutlery (excl. silver and plated cutlery) and edge tools	1.8	86
Foundry and machine shop products, n.e.c.	1.6	67
Electrical machinery, apparatus and supplies	0.9	63

* These 13 manufacturing industries are the most important in the state. Value added in each industry was over $25 million in 1928, and in 1929 ranged between 52 per cent (cutlery) and 4 per cent (foundry and machine shops) of the value added by manufacture in the entire country.

[32] Value added is not reported in the Pennsylvania census.

29. Differences in the ratio of capital to value added for different industries correspond to those noted in the comparison with value of product. The departures from this earlier comparison, so far as the data relate to the same establishments, will be in proportion to the variations of the entries

Table 30

Ratio of Capital Investment to Value Added,
Massachusetts, 1928

Frequency Distribution of 57 Manufacturing Industries classified according to Ultimate Use of Product

Ratio of Capital to Value Added	Number of Industries*		
	Total	Consumption goods	Capital goods
0.0–0.4	..	..	..
0.5–0.9	3	2½	½
1.0–1.4	21	17	4
1.5–1.9	19	14	5
2.0–2.4	8	6	2
2.5–2.9	4	3	1
3.0–3.4	1	1	..
3.5–3.9	1	1	..
Total	57	44½	12½
Median ratio	1.6	1.6	1.7
Average deviation	0.5	0.5	0.4

* Electrical machinery, apparatus, and supplies is entered in each classification with half weight.

in the second column, showing value added as a percentage of value of product. The industries here given are not many, yet they show the variation and the general pattern of the capital ratio. It is high in primary textile manufacture (cotton, woolen and worsted goods), low in the manufacture of breadstuffs and boots and shoes. Such industries as textile machinery, shown to be heavily dependent upon capital in the earlier tabulations, appear again as industries with high

ratios of capital to value added. The variation within the general groups is indicated more clearly in the frequency distribution of ratios of capital to value added computed for 57 manufacturing industries in Massachusetts (Table 30).[33]

Ratio of capital to number of wage earners; horsepower per worker

In that capital as currently measured is an amalgam of goods purchased and valued at various price levels (unless the valuations are on the basis of replacement costs) any comparison with items reflecting current price levels is subject to qualification. A contrast of capital with some physical element of the manufacturing process is useful therefore in picturing the significance of capital in manufacturing. The most important of such ratios is that which relates the investment to the number of workers. This is in some ways a sensitive ratio, for, other things being equal, an added investment (fixed capital) will tend to reduce the relative number of wage earners. A highly mechanized industry will probably have relatively few workers and the ratio will be high. Under opposite conditions, the ratio will be low. If we recognize and allow for this contributory relationship between the two items we compare, the following figures on 'capital per capita' in various industries will prove helpful in indicating the relative roles of these major productive factors in manufacturing. The first comparison (Table 31) is based on the aggregates of Chapter II. The capital estimates, it will be remembered, have been derived from the corporation records of the Treasury Department. The horsepower-wage earner comparison is based entirely upon the Census of Manufactures statistics as analyzed in Chapter II.

On the average, about $3,000 of fixed capital is the equipment with which the manufacturing employee worked in 1929. The group average is lowest for capital goods indus-

[33] Only industries reporting value added of more than $5 million in 1928 are included in this comparison.

tries, highest for producers' supplies. Where the role of labor is quite important, capital investment per worker is less, e.g., in the wearing apparel subgroup of consumption goods. We have had repeated evidence of the large number of wage

Table 31

Capital Investment and Horsepower of Primary Movers, per Wage Earner, 1929[1]

Manufacturing Industries classified according to Ultimate Use of Product

	Per Capita Investment			
Ultimate Use	Fixed capital	Circulating capital	Total capital[2]	Horsepower
Consumption goods	$2,771	$1,955	$5,585	3.7
Capital goods	2,534	1,583	4,578	5.1
Construction materials	3,994	1,727	6,310	7.6
Producers' supplies	4,952	2,087	8,450	8.2
All manufactures	3,049	1,850	5,681	4.9
Consumption goods				
Foods	4,261	2,840	8,442	4.9
Wearing apparel, etc.	1,544	1,483	3,459	2.1
Household goods	2,364	1,669	4,621	3.8
Transportation				
Motor cars	2,818	2,061	5,349	5.2
Supplies and other	10,164	4,336	16,607	6.4
Publications	3,264	1,299	6,524	4.7
Other	5,265	3,469	12,296	5.6

[1] For data underlying these ratios, see Ch. II and Ap. VI.
[2] Includes miscellaneous assets.

earners in these industries, particularly those fabricating textiles. Food manufacture, on the other hand, requires a high capital investment per wage earner.

Fixed capital investment involves more than direct production equipment, of course. The next section will endeavor to indicate something of the relative importance of land and

buildings and of machinery in the fixed capital total. Our present figures, however, relate to the composite. Some measure of the application of power to manufacturing processes, relative to the labor factor, is to be had in the ratio of horsepower to number of wage earners. This comparison, which of course is greatly influenced by the peculiar uses of power

Table 32

Horsepower per Wage Earner, 1929

Manufacturing Industries classified according to Stage of Production, Ultimate Use, and Durability of Product

Economic Group	Horsepower per Wage Earner	Economic Group	Horsepower per Wage Earner
Finished goods, total *	3.9	Durable goods, total	5.4
Consumption goods	2.8	Capital and construction goods	5.9
Capital goods	3.2	Consumption goods	4.1
Unfinished goods, total *	6.8		
Consumption goods	5.5	Semidurable goods	2.7
Capital goods	8.0	Transient goods	6.3

* Includes also construction materials and producers' supplies.

equipment, indicates that the capital goods industries possess a greater power capacity per wage earner than consumption goods industries. This is in contrast to the greater fixed capital investment in the latter group. But in general the capital and horsepower ratios are not dissimilar. Producers' supplies and construction materials are by the power criterion still the relatively heaviest users of capital.

Although subject to various qualifications,[34] the per capita horsepower comparisons are suggestive. In Table 32 are summarized the ratios for certain groups for which capital estimates are not available. In general, the results are not unlike those obtained when the aggregate power capacity in

[34] The horsepower ratios are subject to two major qualifications: (1) they are unduly influenced by peculiar needs of certain industries, e.g., the need for great pressures; (2) the basic statistics are affected by certain biases arising from the use of purchased electric current (see Ch. I).

these several groups was compared (Ch. II). Outstanding is the typically greater per capita use of power in industries at the earlier stage of manufacture, the low ratio for semi-durable goods, the relatively high ratio for transient goods.

Ratios of capital and horsepower to number of wage earners for particular industries can be calculated from the de-

Table 33

Capital Investment and Horsepower per Wage Earner
Major Industrial Groups, Pennsylvania, 1929

Industrial Group	Capital per Wage Earner	Horsepower per Wage Earner	Rank in Col. (1)	Rank in Col. (2)
Chemicals and allied products	$12,052	8.5	1	3
Metals and metal products, primary	7,872	18.4	2	1
Foods and kindred products	6,036	5.4	3	5
Paper and printing	5,316	4.7	4	6
Clay, glass, and stone products	5,225	9.1	5	2
Metals and metal products, secondary	4,995	6.2	6	4
Lumber and its manufactures	3,554	4.2	7	7
Leather and rubber goods	3,060	2.7	8	8
Textiles and textile products	1,981	1.3	9	9
Tobacco and its products	1,140	0.3	10	10

tailed state estimates. These data on industry-to-industry variation may be supplemented by certain information on differences within particular industries. Since no data on horsepower were collected in the Massachusetts Census, the comparisons in Tables 33–35 relate only to Pennsylvania. Although the definition of capital differs somewhat from that used in compiling the national figures from the Treasury Department, the Pennsylvania data are satisfactory for comparisons within the table.

When measured against the labor requirement of the industry, the heaviest use of capital in Pennsylvania is in the chemical industries group, which here includes as its most important component the refining of petroleum products. In industries where considerable manual effort is required, where mechanized processes have not made headway against

the peculiar circumstances of the manufacturing process, the average capital per wage earner is low. Thus, in the leather and rubber group, and more noticeably in the textile and tobacco groups, the per capita investment is low. The tobacco group for Pennsylvania is weighted by the cigar industry, in which the labor requirement in 1929 was heavy and the capital requirement light.

Table 34

Capital Investment per Wage Earner, Pennsylvania, and Horsepower per Wage Earner, Pennsylvania and United States, 1929

Selected Manufacturing Industries

Industry	Pennsylvania Capital per wage earner	Pennsylvania Horsepower per wage earner	United States Horsepower per wage earner
Dominantly consumption goods	$17,974	6.8	..
Gasoline	16,922	33.2	33.5
Ice, manufactured	15,025	11.3	..
Oils	13,061	10.5	10.1
Chocolate and cocoa products	12,105	6.7	5.3
Beverages	10,533	9.1	10.3
Ice cream	8,050	9.0	..
Chemicals, other than petroleum products	7,341	8.5	8.1
Oilcloth and linoleum	6,929	1.8	2.2
Canned and preserved goods	5,569	8.6	13.6
Paper, pulp, and products	5,503	2.3	1.9
Printing	4,804	0.9	..
Tobacco products, other than cigars	4,281	4.3	3.8
Dyeing and finishing textiles	4,220	3.9	4.3
Meat packing	4,211	11.2	..
Sheets, iron and steel	4,167	2.0	2.0
Carpets and rugs	4,137	3.0	5.3
Cotton goods	4,124	3.8	4.6
Leather, sole and tanned	3,954	3.0	3.9
Woolen and worsted and felt goods	3,902	1.6	3.2
Motor vehicles	3,863	4.3	..
Other leather products	3,712	2.1	1.8
Confectionery	2,911	1.9	1.8
Bread and other bakery products	2,644	5.9	..
Tin and terneplate	2,502	3.1	2.6
Furniture	2,322	4.2	3.7
Automobile parts	1,992	0.6	0.6
Hosiery, all	1,664	0.8	0.7
Boots and shoes			

(*Table 34 concluded*)

Industry	Pennsylvania Capital per wage earner	Pennsylvania Horsepower per wage earner	United States Horsepower per wage earner
Dominantly consumption goods (concluded)			
Silk goods, incl. rayon	1,657	1.3	..
Silk and rayon, yarns and thread	1,571	2.6	..
Underwear	1,519	0.6	1.4
Radios and parts	1,407	0.8	..
Clothing, men's	900	0.2	0.3
Cigars	851	0.3	..
Clothing, women's	800	0.2	0.2
Shirts	563	0.3	0.3
Median	4,039	3.0	..
Dominantly capital goods			
Pig iron	$19,658	79.4	..
Coke	15,027	19.7	19.1
Cement	13,926	36.6	35.5
Bars, iron and steel	10,026	24.0	..
Billets, blooms, and slabs	9,854	19.3	..
Engines, railroad	9,034	13.9	8.9
Plates, iron and steel	8,825	24.3	..
Railroad supplies	8,553	6.5	..
Steel shapes	8,069	21.5	..
Ingots, iron and steel	7,883	17.7	..
Electric machinery, apparatus, and supplies	7,483	4.7	2.7
Cars and parts, railroad	6,817	6.6	6.0
Wire and wire products	6,445	10.9	6.7
Lumber, planing mills	5,833	8.0	7.5
Machinery and parts	4,795	4.7	..
Boilers, tanks, stacks, drums	4,772	6.9	..
Terra cotta	4,705	4.1	..
Bolts, nuts, washers, and rivets	4,553	7.2	4.1
Pipes and tubing	4,329	10.3	..
Brick	4,211	6.3	5.7
Hardware and specialties	4,081	2.3	2.2
Glass and products	3,660	5.3	4.7
Plumber supplies and fittings	3,537	2.0	3.6
Structural iron and steel	3,537	5.3	4.8
Castings, iron and steel	3,511	4.8	..
Median	6,445	7.2	..

Average horsepower per wage earner varies from industry to industry in approximately the same manner as does total capital investment. However, certain industries have extra heavy demands for power, and so affect the averages. Particularly is this true of the primary stages of metal manufactures, chiefly, of course, the refining of ores and the rolling

of iron and steel. The power requirements of this group place it first in importance, reversing and by as wide a margin, the relative ranking based on the capital investment of the group and that of chemicals. The clay, glass, and stone products group also moves up in importance when horsepower is considered, influenced by the heavy power needs of industries such as cement. This industrial group moves from fifth place in the ranking based on capital investment to second in importance in terms of power capacity; in general, however, the rankings are similar.[35]

Certain of the industries falling within the industrial groupings of Table 33 are shown separately in Table 34, classified according to ultimate use of their products. These individual industry measures relate only to Pennsylvania, as noted, and can hardly be taken to represent any general 1929 relationships that held true for the country at large. However, we can secure ratios of horsepower per wage earner from the federal Census, and for those industries for which the data seem comparable, both Pennsylvania and United States ratios are given. In almost every instance there is close agreement between the state and the countrywide ratios of horsepower to number of wage earners.[36]

The highest of the individual industry ratios of capital to number of wage earners is for blast furnaces, with an investment in plant and equipment of almost $20,000 for every wage earner employed. At the opposite extreme is the investment (fixed capital) of less than $600 for each wage earner making shirts. The range in horsepower requirement is even larger and the same industries are at the extremes. Factories manufacturing men's and women's clothing average 0.2 horsepower per worker, and those making shirts 0.3, but pig iron blast furnaces had an average of 79.4 horsepower per worker. Within this range there is considerable variation. In general it will again be observed that the primary stages of

[35] The coefficient of rank correlation for these 10 pairs of items is +.84.

[36] The degree of correlation of the 38 industry comparisons is measured by a coefficient of +.98.

manufacture require the heavier capital investment per wage earner. There is a relatively heavier per capita investment in the making of cloth than in its fabrication into articles of clothing, in tanning leather than in making boots and shoes, in sawing lumber than making furniture, in paper making

Table 35

Intra-Industry Variation in the Ratio of Capital to Number of Wage Earners

Minor Areas of Pennsylvania, 1929

Industry	State Average Capital per Wage Earner (*thousands of dollars*)	No. of Ratios for Minor Areas	Range (*thousands of dollars*)	Average Deviation from State Average	
				Thousands of dollars	Percentage
Dominantly consumption goods					
Ice, mfd.	16.9	13	22.9	4.8	28.4
Carbonated and soft drinks, incl. cereal beverages	12.1	9	32.3	5.5	45.5
Ice cream	10.5	13	16.1	4.4	41.9
Newspaper, periodical, and job printing	5.5	18	6.1	1.4	25.5
Bread and other bakery products	2.9	18	2.1	0.5	17.2
Furniture	2.5	13	2.4	0.6	24.0
Hosiery, silk	2.0	6	1.5	0.4	20.0
Silk goods, incl. rayon	1.7	14	2.2	0.5	29.4
Boots and shoes	1.7	9	1.6	0.5	29.4
Dominantly capital goods					
Cement	13.9	3	7.5	3.0	21.6
Machinery and parts	4.8	18	6.4	1.2	25.0
Pipes and tubing	4.3	6	5.4	1.7	39.5
Brick, building	4.2	14	10.1	1.5	35.7

than in printing, in industries refining metals than in those fabricating metal products. This is not an unexpected relationship; for as products reach stages close to the final consumer the influence of his varied tastes becomes more pronounced, resulting in stylized goods which require relatively

more labor to produce. At the earlier stages the manufacturer's attention is devoted to the refining of raw materials, often on a large scale and often possible only by means of processes requiring heavy capital investment.

The variation among industries with respect to the ratio of capital to labor is undoubtedly matched by variation within a single industry, from establishment to establishment, and from locality to locality. Examination of ratios of capital to wage earners for particular industries computed for various political subdivisions of the State of Pennsylvania provides some information on the degree of intra-industry variation. Unfortunately the subdivision reports are not given in full detail for every industry and variations in the character of the products manufactured make comparisons for certain industries dubious. Comparisons over as large an area as seems feasible are given in Table 35. The average departure from the state-wide figure appears to be as much as 25 per cent.

Elements of capital investment, Massachusetts

Approximately 10,000 manufacturing establishments in Massachusetts reported their capital investment in the 1928 state census. Reference has been made in preceding sections to the aggregate investment of these concerns; this section will summarize briefly information on the components of the total gained by a study of the individual returns.[37] The survey was made chiefly to determine the magnitude of these components, since we know of no comparable source of information on the elements of fixed capital. In Table 36 the four divisions of capital reported in the Massachusetts census (1) land (adjusted to include the estimated value of rented property), buildings, and fixtures, (2) machinery and tools, (3) inventories, (4) cash, accounts receivable, and

[37] Through the cooperation of Roswell Phelps, Director of Statistics, Massachusetts Department of Labor and Industries, the National Bureau secured a special transcription of the individual census reports on capital investment and number of wage earners in 1928. Identity of the concerns was not disclosed, the several items being copied onto cards by the Department's clerks. The measures are described at greater length in Ap. IX.

Table 36

Elements of Capital Investment * in Manufacturing Industries

Massachusetts, 1928

	Land, Buildings, and Fixtures (1)	Machinery and Tools (2)	Inventory (3)	Cash, Accounts Receivable, and Sundries (4)	Total Capital (5)
			(Millions of Dollars)		
All manufactures	853	629	697	774	2,953
Consumption goods	514	421	497	529	1,962
Capital goods	146	110	119	119	494
Construction materials	27	17	23	29	96
Producers' supplies	167	81	58	96	401
Finished goods	451	293	400	478	1,622
Unfinished goods	402	335	297	296	1,330
Durable goods, total	247	180	233	266	926
Capital and construction goods	172	127	143	148	590
Consumption goods	75	53	90	118	336
Semidurable goods	278	283	334	315	1,210
Transient goods	329	165	130	192	816
			Percentage of Total Capital		
All manufactures	28.9	21.3	23.6	26.2	100.0
Consumption goods	26.2	21.5	25.4	26.9	100.0
Capital goods	29.6	22.2	24.1	24.1	100.0
Construction materials	28.1	17.7	24.0	30.2	100.0
Producers' supplies	41.6	20.2	14.5	23.7	100.0
Finished goods	27.8	18.1	24.7	29.4	100.0
Unfinished goods	30.2	25.3	22.3	22.2	100.0
Durable goods, total	26.7	19.4	25.2	28.7	100.0
Capital and construction goods	29.2	21.5	24.2	25.1	100.0
Consumption goods	22.3	15.8	26.8	35.1	100.0
Semidurable goods	23.0	23.4	27.6	26.0	100.0
Transient goods	40.3	20.2	16.0	23.5	100.0

* The total for all industries in this table differs from the figure published by the Massachusetts Department of Labor and Industries because an estimate of the value of rented land, buildings, and fixtures, is included (see Ap. IX). If these estimates are excluded, the entries in col. 1 become: 635; 407, 108, 23, 97; 357, 278; 194, 131, 63, 213, 228; and in col. 5: 2,735, 1,855, 456, 93, 332; 1,528, 1,207; 873, 548, 324, 1,146, 716.

sundries are shown for all Massachusetts industries and for various economic groups.

The aggregates of Table 36 necessarily reflect the characteristics of manufacturing in Massachusetts. That is, the various industries are combined by a distinctly different set of weighting factors than governs all manufacture in the United States. In particular, the consumption goods group in Massachusetts is heavily weighted by the textile and boots and shoes industries. The capital goods group is not well represented and is confined chiefly to finished equipment industries. Accordingly, the reader should not apply the results in any exact manner beyond the boundaries of the state.

Of the four items of capital listed in Table 36, machinery and tools seem to be of least importance in the total, but by a slight margin. Approximately one-fifth of total capital in Massachusetts manufacturing establishments takes this form. The value of rented machinery (in contrast to rented buildings and fixtures) is not included in the totals, however, and in one industry, boots and shoes, would be a relatively large item. The largest percentage of total capital appears as land, buildings, and fixtures,[38] though in some industries, particularly durable and semidurable consumption goods, both inventory and cash and receivables are larger. The value of inventories in most instances comprised between 20 and 30 per cent of total capital assets.

Some interesting differences in capital needs are observed in Table 36. The heavy capital investment in industries making producers' supplies noted earlier seems to be explained, in Massachusetts at least, by the heavy investment in land and buildings (the sample is quite small, however). In industries whose products are at the unfinished stage, the investment in machinery and tools is relatively high, as our earlier results might suggest. In finished goods industries, on the other hand, cash, receivables, and sundries are distinctly

[38] This is true despite the probable understatement of the value of rented property, since the adjustment made to cover rented property concerned only companies that reported no real estate whatever.

higher, relatively. These items of circulating capital are greater also for durable goods, though inventory is relatively of most weight (27.6 per cent of all capital) in the semi-durable goods industries. In this same group, which is domi-

Table 37

Role of Capital in Manufacturing Industries

Massachusetts, 1928

	Percentage of Value of Product					
	Total capital	Land, buildings, and fixtures	Machinery and tools	Inventory	Cash, accounts receivable, and sundries	Value of Machinery and Tools per Wage Earner
All Manufactures	92	26	20	22	24	$1,163
Consumption goods	82	22	18	21	22	1,048
Capital goods	111	33	25	27	27	1,349
Construction materials	90	25	16	22	27	953
Producers' supplies	140	58	28	20	33	2,036
Finished goods	79	22	14	19	23	897
Unfinished goods	115	35	29	26	26	1,570
Durable goods, total	95	25	19	24	27	1,089
Capital and construction goods	107	31	23	26	27	1,278
Consumption goods	80	18	13	22	28	806
Semidurable goods	86	20	20	24	22	1,008
Transient goods	98	39	20	16	23	1,753

nated of course by the various textile industries, we find a high percentage of total capital in the form of machinery and tools. The greatest relative investment in land and buildings is in the manufacture of transient goods.[39]

The various elements of capital may be contrasted with value of sales (Table 37). This comparison supplements the data on capital turnover discussed in a preceding section. In addition, Table 37 includes measures of the per capita use of machinery in Massachusetts manufacturing. In general it

[39] A division of these groups according to stage of production (Table b, Ap. IX) reveals a high plant investment for unfinished capital goods, higher inventories and cash relative to total capital for finished goods manufacture.

Table 38

Per Capita Use of Machinery and Tools in Manufacturing Industries
Massachusetts, 1928

Classification of Establishments Manufacturing Finished and Unfinished Goods

Value of Machinery and Tools per Wage Earner * (*thousands of dollars*)	Finished Goods							Unfinished Goods						
		Consumption Goods							Consumption Goods					
	Total	Durable	Foods	Other non-durable	Capital Goods	Construction Materials	Producers' Supplies	Total	Durable	Foods	Other non-durable	Capital Goods	Construction Materials	Producers' Supplies
0.1– 1.0	3,553	645	1,260	1,648	702	539	149	999	241	..	758	145	17	291
1.1– 2.0	549	98	256	195	216	137	42	239	56	..	183	59	3	248
2.1– 3.0	197	26	94	77	59	27	10	88	15	..	73	21	4	110
3.1– 4.0	109	12	64	33	30	16	2	50	6	..	44	11	..	39
4.1– 5.0	62	6	37	19	21	13	1	19	2	..	17	6	..	28
5.1– 6.0	31	..	21	10	6	3	3	15	..	..	15	2	..	18
6.1– 7.0	23	4	16	3	8	3	..	13	3	..	10	..	..	4
7.1– 8.0	12	..	8	4	4	2	..	4	1	..	3	..	..	4
8.1– 9.0	5	..	4	1	..	2	..	2	..	..	2	..	..	2
9.1–10.0	12	3	6	3	6	2	..	3	1	..	2	1	..	1
10.1–11.0	4	..	3	1	1	..	..	1	..	..	1	..	..	..
11.1–12.0	3	..	1	2	1	..	..	..	..	..	..	..	..	2
12.1–13.0	2	..	1	1	..	..	..	2	2	..	..	..	..	3
13.1–14.0	4	..	3	1	..	1	..	..	..	..	..	..	..	..
14.1–15.0	4	..	2	2	1	..	..	..	..	..	..	..	..	3
15.1–20.0	12	1	4	7	1	..	1	2	..	..	2	..	..	..
over 20.0	11	..	3	8	1	..	..	3	1	..	2	1	..	1
Total	4,593	795	1,783	2,015	1,057	745	208	1,440	328	..	1,112	246	24	754

* Entries in the higher brackets are of limited significance since they frequently result from a large plant being operated by a skeleton working force.

will be found that the measures agree reasonably well with estimates presented earlier. Capital investment is most important in the producers' supplies industries, particularly capital invested in land and improvements. The relative use of machinery in the unfinished goods group is high, as it is also in the capital and producers' goods groups. In the classification according to durability, the transient goods group shows the greatest per capita investment in machinery.

The per capita use of capital in manufacturing processes varies widely from industry to industry; it varies also between factory and factory. From the detailed records of the Massachusetts Census we learn something about the typical ratio of the per capita investment in machinery. This capital-labor ratio for different types of goods is shown in Table 38. The entries are the number of concerns with the indicated proportion between capital and number of wage earners. In all, 2,704 concerns were classified as making unfinished goods, 7,202 as making finished goods. For 839 establishments, however, no ratio was computed, because either one of or both the component elements, capital and number of wage earners, was not reported.

It is clear from the distributions of Table 38 that in all industrial groups the typical investment in machinery and tools is less than $1,000 per worker. In many establishments and in many industries the ratio is higher, but in over half the concerns in every group except unfinished producers' supplies, the value of machinery did not exceed $1,000 for each wage earner.

The frequency distributions of the use of machinery in Massachusetts complete the evidence presented on the role of capital in manufactures.[40] The purpose has been to offer some measure of the capital used in manufacturing different kinds of goods at the time of our survey, to differentiate the uses to which this capital was put, and to show its importance

[40] For further detail drawn from the Massachusetts survey, including a tabulation for the largest 15 industries of the state, see Ap. IX.

in relation to other production factors. No detailed summary is here presented either of this part of the study or the larger problem of interrelations of productive factors to which this chapter is devoted. Something of a summary of these materials will be found in Chapter IV.

IV

Summary: The Pattern of Manufacturing Production

In 1791 Alexander Hamilton presented to the new Congress his famous report on Manufactures. In doing so, he listed some seventeen groups of manufacturing industries which, in his words, had "grown up and flourished with a rapidity which surprises, affording an encouraging assurance of success in future attempts".[1] But even Hamilton could not foresee the success that did attend these efforts, or the transition by which the industries of 1791, whose products ranged from

[1] The 17 commodity groups are: "1) *Of Skins*—Tanned and tawed leather, dressed skins, shoes, boots and slippers, harness and saddlery of all kinds, portmanteaus and trunks, leather breeches, gloves, muffs and tippets, parchment and glue. 2) *Of Iron*—Bar and sheet iron, steel, nail rods and nails, implements of husbandry, stoves, pots, and other household utensils, the steel and iron work of carriages, and for shipbuilding, anchors, scale beams and weights, and various tools of artificers, arms of different kinds; though the manufacture of these last has of late diminished for want of demand. 3) *Of Wood*—Ships, cabinet wares, and turnery, wool and cotton cards, and other machinery for manufactures and husbandry, mathematical instruments, coopers' wares of every kind. 4) *Of Flax and Hemp*—Cables, sail-cloth, cordage, twine, and pack thread. 5) Bricks and coarse tiles, and potters' wares. 6) Ardent spirits, and malt liquors. 7) Writing and printing paper, sheathing and wrapping paper, paste boards, fullers' or press papers, paper-hangings. 8) Hats of fur and wool, and mixtures of both; women's stuff and silk shoes. 9) Refined sugars. 10) Oils of animals and seeds, soap, spermaceti and tallow candles. 11) Copper and brass wares, particularly utensils for distillers, sugar refiners and brewers; andirons and other articles for household use, philosophical apparatus. 12) Tinwares for most purposes of ordinary use. 13) Carriages of all kinds. 14) Snuff, chewing and smoking tobacco. 15) Starch and hair powder. 16) Lamp-black and other painters' colors. 17) Gunpowder." In addition, the report stated, there was a "vast scene of household manufacturing, which contributes more largely to the supply of the community than could be imagined without having made it an object of particular inquiry".

Hamilton's report and his correspondence on the subject of manufactures have been published under the editorship of A. H. Cole in *Industrial and Commercial Correspondence of Alexander Hamilton* (Business Historical Studies, Vol. I, A. W. Shaw Co., 1928). (Citations are from pp. 279–80.)

starch and hair powder to various articles of iron, became the manufacturing system of 1929. During the intervening one hundred thirty-eight years the scale of operations, the technology of manufacturing processes, the markets served, have all been profoundly modified, the flow of goods tremendously increased. New areas of manufacturing activity have been developed, new products undreamed of—the automobile, the various forms of electrical apparatus, petroleum and its distillates, rayon. The making of lampblack, so encouraging to Hamilton at the turn of the eighteenth century, is today completely overshadowed by the making of carbon black (from gas instead of coal or wood tar) produced to meet the needs of the automobile tire industry. Virtually all the articles of household manufacture in 1791 are now made in factories; more and more household duties have been supplanted by services originating in the manufacturing field or have been made less burdensome by reason of investment in factory-made equipment. In every way the pattern of manufacturing production has become more elaborate.

Just over a hundred years after Hamilton's report appeared the comprehensive Census of 1899, from which the present series of Census reports date. By the turn of the century the country had rounded out its frontier, had set up its large manufacturing centers. The Census of 1899 indicated a working force of 4,713 thousand wage earners making a wide range of manufactured products. The capital invested in manufacturing plants was estimated at $8,975 million.

Nevertheless manufacturing in 1929 stands in striking contrast to manufacturing in 1899. The most evident change during the three intervening decades has been in the scale of operations. Yet the rise of new products, the development of new techniques, the introduction of new methods have also greatly altered the structure of manufacturing. New industries have come into being. Old activities have dwindled

in importance or have dropped out of the industrial picture. Such industries as the manufacture of aircraft, rayon, mechanical refrigerators, collapsible tubes, artificial leather, and aluminum are not listed in the Census of 1899. Indeed at that time most of these products were unheard of. In 1929, on the other hand, the statistics on hammocks, horseshoes, oakum, and wood carpet were no longer deemed of sufficient importance to warrant reporting in special industrial groups. Of greater importance for the manufacturing structure at large has been the growth of certain industries, the continued decline of others.

We need hardly go back to the time of Hamilton and the country's first report on manufactures for evidence of the changing character of manufacturing operations, even though the comparison is most striking when made with that early record. Permanent shifts in emphasis as well as tentative adjustments are continually taking place within the aggregate of manufacturing activities. Yet these changes only modify, in varying degree, what we believe to be more or less persistent attributes of manufacturing operations.[2] For in large part the characteristics of a dynamic economy are structural, not haphazard, transient relationships. They are characteristics of a manufacturing system that has been built up over a long period; they are slow to change because of the stabilizing influence of human institutions, the stability of a slowly altering fund of capital and knowledge, and the peculiar and unyielding features of particular manufacturing operations.

[2] At various points in Ch. II and III some indication of changes in the different relations studied has been given. Dr. Kuznets' estimates of the value of the end-products of manufacturing (cited in Table 1) suggest that measures relating to the disposition of productive resources are subject to considerable alteration during periods of severe recession. The 1919 and 1929 ratios are almost identical, however. Indeed, the stability of the percentage apportionment between capital formation and consumers' outlay (at a later stage than that to which the capital-consumption goods ratio we have examined relates) during this full period is commented upon by Dr. Kuznets in the presentation of his measures (*National Income and Capital Formation, 1919–1935*, National Bureau of Economic Research, 1937, pp. 46–7).

The few comparisons made of the relative importance of productive factors for 1929 and other years (pp. 60, 73, 100) indicate an equally high uniformity.

The manufacturing structure might be described in various ways, with varying emphasis upon its different aspects.[3] It is not our purpose to explore the concept. We simply try to suggest certain characteristics of manufacturing activities by means of a cross-section picture. It is as if from a reel of motion picture film a single still photograph had been abstracted. For we have taken, at what amounts to an instant in time, a 'still' photograph of a dynamic economy. We have done this in order to determine, for at least one short period, the various interrelations and characteristics of a most important type of productive activity. We presume no static equilibrium on the basis of our findings. We simply say that at the brink of the greatest recession in business activity of which we have record, this is what those engaged in manufacturing were doing. We present, as of 1929, no diagnosis of incipient ills. We believe that the persistent relationships of the structure we would describe have a life span longer than the average business cycle. To the degree that our measures reflect these relations they may contribute to the better understanding of all business cycles, and not alone of the major collapse that followed so closely the period to which they relate.

To two closely related aspects of the structure of manufacturing production attention has mainly been devoted: (1) the allocation of economic resources to the manufacture of different classes of goods; (2) the relative use of different productive factors. A complete cross-section view of the manufacturing structure might touch also on the extent of corporate ownership or the regional distribution of manufacturing activity. Problems of personnel, of labor relations, and of character of work might also be considered. However, objective criteria for the analysis of these and other attributes of manufacturing are not always easily determined.

[3] See for example the diverse meanings given to 'structure of production' by F. A. Hayek (*Prices and Production*, London, George Routledge & Sons, 1931, p. 35) and E. A. G. Robinson (*The Structure of Competitive Industry*, Harcourt, Brace, 1932).

Moreover, certain of these phases of the problem have received detailed examination elsewhere. It has seemed well to center our attention on the two major problems stated and to utilize only readily available data that give promise of improving our knowledge of the character of manufacturing production.[4]

Rather than attempt to summarize in this concluding chapter all the detail outlined in the preceding chapters and the nine appendices, we shall state certain general propositions based on these materials, and endeavor to indicate their significance. Obviously such a method of review leaves much to be desired; it leaves unmentioned a great deal that the careful reader will have found by close scrutiny of the various tables. The following paragraphs, however, point to major findings.

A high percentage of the manufactured goods produced in 1929 was destined for human consumption. Of the aggregate sales of manufacturing establishments in 1929, somewhat over 70 per cent is identified with consumers' goods. In terms of value added, the ratio is exactly 70 per cent. For the more narrowly defined group of consumption goods, exclusive of any part of producers' supplies or construction materials, the percentages are 60 and 58 respectively. Unfortunately we have no ready means of measuring 'output' other than in these value terms, and the 'contribution' of the manufacturing enterprise is perhaps not well appraised by such market values. Moreover, we are not sure of the extent to which the flow of capital goods is diverted to replacement of existing capital or spent for expansion purposes. Nonetheless, great significance attaches to this ratio between consumption and capital goods, particularly in view of the greater cyclical

[4] The data with which we have worked are so detailed and so voluminous that some condensation has been necessary. As a result, our analysis has only infrequently been concerned with the description of particular manufacturing processes. If the realism given by titles of individual industries and processes is missing, it is because the scope of the investigation and the desire to isolate general relationships have subordinated the individual manufacturing activity. In Ap. I and II various measures relating to the 326 industry divisions recognized by the Bureau of the Census are presented.

amplitude of the fluctuations in capital goods production. But it is just because of these different responses to changes in business activity that the 1929 proportions between the values of manufactured capital and consumption goods cannot be taken to define a persistent relationship. The general magnitudes of the different operations are evident, however. Since 1929 was on the whole a year of expanded business activity, the figure of 70 per cent of the total that we associate with consumption goods and related products is in all probability a lower limit of the measure than would be found in a less prosperous year.

The four major divisions of consumption goods industries, in order of magnitude of value added by manufacture, are wearing apparel and personal equipment, foods, household goods, and motor vehicles. Together the value added in these four groups of industries totaled 80 per cent of the value added for all consumption goods in 1929, and 45 per cent of the value added by all manufactures.

Goods with a relatively long service life (over two years) made up 43 per cent of the total value of products, 47 per cent of the total value added by manufacture. Roughly two-thirds of these durable goods were capital or construction goods; the other third being destined for consumption use. Transient goods, including all producers' supplies, contributed approximately one-third of the total (36 per cent of gross value of products, 33 per cent of value added). The third group, semidurable goods, made up 20 per cent of both gross value of product and of value added.

Most manufacturing was done in plants whose products we have classed as 'finished', that is, the products were sold for purposes other than further manufacture. The extent of intermediary fabrication (i.e., production of unfinished goods relative to the production of finished goods) was greatest in the capital goods group and in the consumers' goods transportation subgroup; it was least for certain types of consumption goods, particularly manufactured foodstuffs.

As a group it would appear that durable goods[5] are to a relatively large degree manufactured in plants at least one stage of manufacture removed from the ultimate users. While it is true that integration of ownership bridges some part of these necessary transfers, it remains significant that in the production of durable goods there are relatively more opportunities for industrial maladjustments. The point is even more suggestive when we observe that of all groups of manufacturing industries those that make durable goods (particularly durable capital goods) call for relatively more labor effort. These durable goods industries employ roughly half the wage earners in manufacturing, which is considerably above the corresponding proportion for value of product (43 per cent). When considered with reference to the wide cyclical amplitude in the output of durable goods, these factors serve to emphasize the strategic importance of the durable goods industries in any explanation of business fluctuations.

For the most part, manufacturing involves the processing of nonagricultural materials. Value added by the fabrication of farm and animal products was but little more than one-fourth of the total value added by manufacture in 1929. On this criterion, the most important materials were metals, whose fabrication accounted for 38 per cent of total value added. The iron group alone accounted for 31 per cent. The fabrication of nonfarm materials required twice as many wage earners as did the processing of farm products. In terms of their value as they enter the first stage of manufacture, however, farm materials are unquestionably more important. Only when we examine the extent of their processing in the manufacturing industries does their importance in the manufacturing process shrink. Our estimates suggest a sixfold

[5] We have no direct estimate of the value of products of finished or unfinished durable goods. All capital goods are durable by definition, and most of the consumers' transportation goods are durable also. Construction materials are also durable in their final use and, while for the most part they are here classified as 'finished' because they receive no further fabrication in the manufacturing system, are destined to undergo considerable change in form beyond the factory door.

increase in the value of minerals, a doubling in the value of farm products.

Measures of the apportionment of various factors in manufacturing are quite similar from group to group, and factor to factor.[6] Subject to some variation, approximately the same proportion of different productive resources is required for the manufacture of goods of the types we have studied. This observation holds whether our measures are expressed in dollars or in physical units. The general similarity of the ratios is to be seen in the comparisons of Chart II.

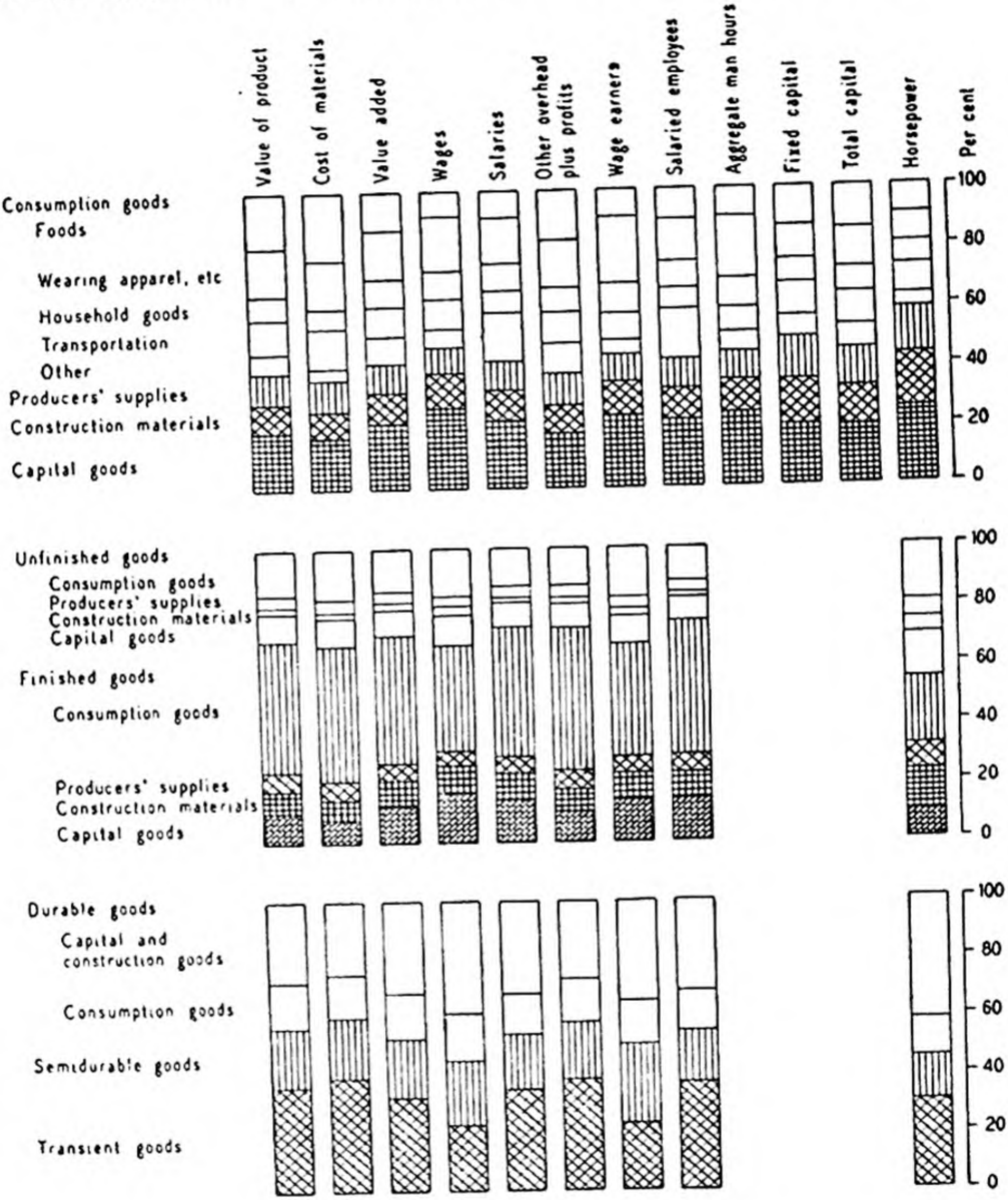
Of the 8,839 thousand wage earners employed in manufacturing industries in 1929 we estimate that 4,900 thousand helped to fabricate consumption goods (55 per cent). Allowance for supplementary consumption goods groups (producers' supplies and residential construction) raises this to about two-thirds of the total. Relatively to other productive factors, a low percentage of total wage earners are employed in making consumption goods, a high proportion in making capital goods. Accordingly we conclude that capital goods require a relatively larger labor input than consumption goods. Only in the group of personal consumption goods, clothing chiefly, does the relative labor requirement exceed that for capital goods. Estimates of aggregate man hours worked in 1929 show no appreciable divergencies from the patterns just described.

The relatively heavier 'input' of labor in capital goods manufacture holds chiefly for industries making finished products. Among industries whose products are unfinished, those making consumption goods show the relatively greater labor investment (relative to value added and other items). It is notable that while durable capital goods as a group call for a significantly greater proportion of total wage earners than of most other items, durable consumption goods do

[6] In some degree this tendency is enforced by our method of estimate. A common ratio was used to allocate items relating to a particular industry whenever diverse products made such allocations necessary.

Chart II

DISTRIBUTION ACCORDING TO TYPE OF PRODUCT OF CERTAIN ITEMS RELATING TO MANUFACTURING OPERATIONS, 1929



not. Rather, it is in the group of semidurable consumption goods, chiefly textiles and textile products, that the proportion of total wage earners is large, relative to other items. When we examine wages paid, rather than number of wage earners, however, the relation is reversed, for the ratio for the subgroup durable consumption goods more closely resembles the ratio for capital goods. The durable goods industries' share of total wages exceeds the proportion of total wage earners associated with these industries. In semidurable goods industries, however, the percentage of total wages is less than the percentage of total wage earners. The average wage, of course, is lower in the semidurable goods group.

Typically, the number of salaried workers in manufacturing industries is roughly 15 per cent of the number of wage earners. The ratio is somewhat lower for capital goods, particularly unfinished capital goods; conversely, it is higher for finished consumption goods. There is clear evidence that the employment of salaried workers is relatively more frequent at the later stages of manufacturing operations. The problems of distribution are probably greater at later stages; as products become more specialized with advanced fabrication the need for salaried administrative assistants becomes greater. There are, of course, certain industries, such as the publication trades, in which salaried employees comprise a large percentage of the labor force. Most of these industries are apparently in the transient goods group, for which the ratio we have discussed reaches a peak (one-fourth of total wage earners).

The composite of overhead costs and profits, exclusive of salaries, is in the aggregate approximately one-fourth of value of product. A relatively high percentage is associated with consumption goods manufacture, particularly finished and transient goods; a low percentage is associated with capital goods, particularly finished capital goods. These variations in elements of costs are defined in later pages; it

is our purpose here only to indicate the divisions of the aggregates among the several groups.

The total capital invested in manufactures in 1929 we estimate at $50 billion. Of this amount, over one-half was used in consumption goods industries; as much as 70 per cent might be traced to the manufacture of products ultimately associated with consumption purposes. Fixed capital finds its greatest use, relative to the use made of other productive factors, in construction materials and producers' supplies; notably less fixed capital was used in the consumption goods group. Only in the foods and transportation supplies subgroups of consumption goods was there a relatively large fixed capital investment.

In the consumption goods group, however, is found the greater relative investment in circulating capital, particularly in the wearing apparel subgroup. No division of these capital items according to other classification schemes is available except on the basis of the state reports for Massachusetts and Pennsylvania. These data suggest that the ratio of capital to sales is slightly higher in the finished goods group. The ratio of capital to number of wage earners is higher for unfinished goods.

Heaviest use is made of mechanical power in the preliminary stages of manufacture. The amount of aggregate horsepower capacity of primary movers in manufacturing in industries making finished goods (54 per cent) is quite disproportionate to that of other factors: 69 per cent of value of product, 71 per cent of value added, 67 per cent of number of wage earners, and even 75 per cent of number of salaried employees.

The making of construction materials and producers' supplies occasions the relatively heaviest power installations. In unfinished capital goods manufacture (cf. steel rolling mills) the share of the total power capacity identified with unfinished industries exceeds the corresponding share of number of wage earners (33.5 against 28.5 per cent). On the

other hand, wage earners play a relatively more important role in the finished goods group. When we examine the power requirements of durable goods, we find that only durable capital and construction goods have a percentage of total horsepower greater than the corresponding percentages for other items, such as value added or number of wage earners. Durable consumption goods clearly have no exceptional need for power facilities. Nor, for that matter, have semidurable goods or transient products, except as has been suggested.

On the average, each wage earner in manufacturing establishments had available, in 1929, power equipment of roughly five horsepower. But the amount of power available varied widely from industry to industry. Per capita horsepower capacity averaged 3.7 for all consumption goods, ranging from 6.4 for the transportation supplies group to 2.1 for the wearing apparel and personal equipment group. In the capital goods group 5.1 horsepower per worker was available, in industries manufacturing construction materials 7.6, and in the producers' supplies group 8.2. Although the comparability of the basic horsepower statistics is in some doubt,[7] the figures show with reasonable accuracy the varying importance of power in manufacturing production. Because of the different ways and quantities in which power is applied, horsepower data are not the best measures of capital use. Data based upon the assets of manufacturing corporations are better adapted to this purpose.

Fixed capital per manufacturing wage earner averaged roughly $3,000; in Massachusetts approximately $1,000 represented machinery and tools. The fixed capital investment was only $1,544 for each worker in the wearing apparel and other personal goods subgroup of consumption goods. Capital goods as a group had a per capita investment of $2,534, construction materials industries $3,994, and pro-

[7] See footnote 10, Ch. I, for a discussion of the merits of the Census horsepower figures.

ducers' supplies $4,952, the highest for any major group. Total capital per wage earner averaged $5,681 for all manufactures as contrasted with the $3,049 per capita estimate of fixed capital alone. Approximately the same increase holds for each group ratio. The consumption goods group ratios are increased most, however, on the addition of circulating and miscellaneous capital items.

The input relations of manufacturing industries are evident in the different elements of manufacturing cost. Chart III summarizes certain measures relating to elements of value of product, value added, and the composite of overhead costs and profits.

Cost of materials (plus fuels) is the largest item of manufacturing cost. The over-all percentage of total value of product was 54.9 in 1929, although the median ratio for the 326 industries was somewhat less (47 per cent). Material costs are a smaller fraction of selling price in industries making finished goods than at prior stages of manufacture, and in industries making durable goods than in those making nondurable goods.[8] Such costs are relatively low for all capital goods, and particularly for finished capital goods. In contrast to 54.9 per cent for all manufacturing industries, material costs in industries making finished capital goods comprised but 42.6 per cent of value of product in 1929.

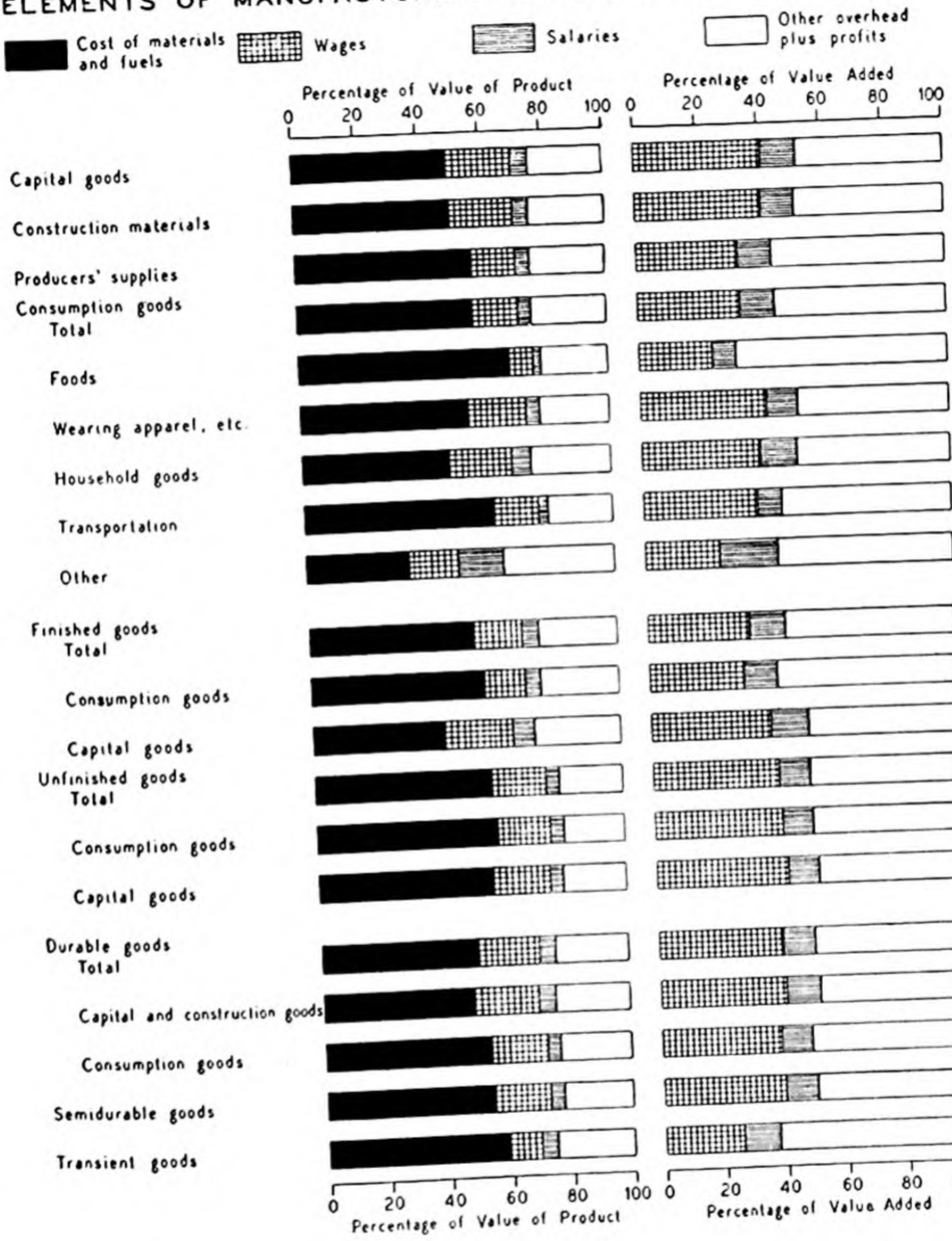
Total wage payments were 15.9 per cent of sales, but the median ratio for the 326 large and small industries was higher, 19 per cent. Of the weighted ratios the highest, for the groups discussed, is that for finished capital goods, 22 per

[8] The magnitude of these ratios is determined by the relationship between the value contributed in the industry and the value created at prior productive stages. Where the manufacturing contribution is small, as for example in food processing, material costs bulk large in the final selling price. Where the fabrication process is elaborate, and starts with simple raw materials, material costs tend to be low. So far as industrial integration results in a lengthening of the manufacturing process in a given industry, the effect may well be to diminish the importance of material costs in the selling price. However, the industrial unit of the Census is the establishment, not the corporation, and therefore much industrial integration does not affect the ratios here presented. That there are wide variations behind the group averages goes without saying. Moreover, the finished and unfinished goods groups are not directly comparable, since many finished goods industries cover the entire manufacturing process.

SUMMARY

Chart III

ELEMENTS OF MANUFACTURING COSTS, 1929



cent. The lowest percentages are for finished consumption goods and transient goods. Again durable capital and construction materials have a common pattern distinct from that of durable consumption goods. Apparently there is closer correspondence in the elements of cost between durable and semidurable consumption goods.

For many purposes, wage payments are properly compared with costs of services originating within the manufacturing process itself, i.e., all costs except materials. Accordingly we turn to measures of fabrication costs as percentages of value added. Of this total, wages account for about 35 per cent, salaries 11 per cent, and overhead less salaries but including profits the rest, 54 per cent. Considerable variation around these general figures is observed.

In capital goods industries wage payments average 40 per cent of value added. Consumption goods industries alone pay 33 per cent of value added in the form of wages, though in the food group these payments fall to less than 24 per cent. The ratio rises to 40 per cent in the wearing apparel group. The discrepancy between capital and consumption goods is less pronounced in the group of industries making unfinished products, more striking in the finished goods division. In all groups, wages are notably a smaller percentage of value added in the finished goods division; other items, particularly miscellaneous overhead plus profits, being larger.

Salary payments appear to be a fairly uniform percentage (roughly 11 per cent) of value added for the different major groups of manufactured goods in 1929. In the consumption goods total, we know of course that they are disproportionately high for the publication group; they are somewhat below the typical figure in the foods and private transportation groups. In most instances, there are probably no significant differences in the salary ratios from group to group.

Overhead costs other than salaries but plus profits, as a percentage of value added, reveals variations complementary

to the measures just described for wage payments, the third item, salaries, showing no wide differences. These overhead costs plus profits are relatively high for consumption goods industries, particularly for foods and the items of the transportation groups. They are relatively low for the capital goods industries. The finished goods group has the higher relative burden of overhead. It has been suggested that sales effort on the part of the manufacturer is greater with finished than with unfinished goods, and if so, the overhead item would reflect such efforts. For information on the components of this residual item, typically half as great as the value added total itself, we have turned to non-Census data.

Treasury Department statistics on the income and expenses of manufacturing corporations in 1929 suggest that of the magnitude roughly corresponding to the Census item 'value added less salaries and wages' about one-fifth represented profits (one-tenth of all fabrication costs and one-twentieth of value of product). Depreciation charges accounted for roughly 10 per cent and taxes 6.4 per cent of this overhead plus profits item. The bulk of these residual costs, however, are masked in a miscellaneous item that in 1929 was 56 per cent of the overhead item. The Dun-Bradstreet 1933 survey of 1,709 manufacturing concerns provides measures of certain items of overhead cost that probably, though not surely, are included in the Treasury miscellaneous item. Selling expenses stand high among the different expense items other than cost of goods reported in the sample survey. This finding supports our belief that some costs of distribution are included in the Census overhead item. No great differences in the character of these costs are indicated for capital and consumption goods industries.

The significance of these conclusions depends upon several conditions. In general, the measures of manufacturing operations in 1929 are important because they help to define cer-

tain characteristics of the manufacturing structure. But how well they do this, how important the areas they define, and how novel the information they give, are questions yet to be considered.

Certain basic measures relating to manufacturing operations hitherto not available have been especially prepared for analysis in this study. Thus the estimates of average hours worked in 1929 in different manufacturing industries provide new measures bearing on an important aspect of pre-recession factory operations.[9] The estimates of industry-to-industry relationships in terms of product outlets (Ap. I) have made possible a new set of measures of the net value of manufactured goods by groups of industries and of the extent to which this value originates within the manufacturing system (Ap. IV). One aim of the survey has been to determine these magnitudes—net value, man hours of labor effort, capital investment—associated with manufacturing operations in 1929.

Most of the data presented in this volume refer to different groups of manufacturing industries. Accordingly, the importance of the measures rests upon the significance of the classification to which they relate. The significance of certain of our groupings has been demonstrated by other investigators. In general the groups have been selected after consideration of their meaning with reference to the source and use made of productive resources. The data we have collated relate to broad industry divisions and are descriptive of the complete groups rather than of the individual industries that comprise them. The measures refer to selected portions of the economic population, as groups.

The significance of the group measures probably varies according as they are: (1) measures relating to the relative magnitudes of the several groups (presented, for the most part, in Ch. II), or (2) measures of the interrelations of productive factors within the groups (cf. Ch. III). The relative

[9] These data are discussed in Ch. I and II, and described at length in Ap. III.

group magnitudes are probably less persistent in the face of changing business conditions than are the interrelations of the productive factors.[10] We should expect, for example, that the proportions defining the distribution of economic resources between consumption and capital goods would be somewhat different in 1933 than in 1929. However, we might expect fewer discrepancies in the relative apportionment of value of product among different items of manufacturing cost. But to the truth of this hypothesis, only similar surveys for other intervals can fully testify.

It is in the broader implications of our study, of course, that its true significance lies. While not providing a complete description of manufacturing operations, or an unequivocal measure of the elements of the manufacturing structure, the survey bears on a most important question. For it relates to ". . . the most obvious economic problem which confronts the inhabitants of any country or of the world as a whole, . . . to determine how the limited natural resources of the community, its limited flow of savings, its limited equipment of human brains and hands, is to be allocated between the infinity of different uses in which they are capable of yielding a harvest of enjoyment".[11] When D. H. Robertson wrote these lines he was chiefly concerned with the guiding forces that control the disposition of economic resources. This "most obvious economic problem" we have not considered, but we have sought to determine in what actual proportions these resources were allocated in an important area of productive activity during 1929.

Some continuing knowledge of how productive resources are being utilized is important even in an economy where administrative decision does not determine their disposition. It is important for the wise decision of public policy. The economist must consider this aspect of the productive struc-

[10] But note the instances of stability in certain of the ratios relating to distribution of productive resources cited in footnote 2 above.

[11] D. H. Robertson, *The Control of Industry* (Harcourt, Brace, 1923), p. 4.

ture in his appraisal of the composite of different productive activities, the student of business cycles must keep it in mind in his search for strategic factors in business fluctuations. The economic historian would find in a succession of cross-section studies of the productive system a wealth of information about the changing structural characteristics of the economy. Since manufacturing comprises an important segment of the productive system, the present survey of the pattern of manufacturing operations contributes to a more complete knowledge of the "obvious problem" of which D. H. Robertson wrote.

The peculiarly important role of durable goods industries has already been mentioned. Notable is the requirement in their manufacture of almost one-half of all manufacturing resources in 1929, the more frequent transfers of the unfinished product from industry to industry resulting in increased opportunities for maladjustment of supply and demand, the relatively heavy demand for factory labor and the even greater relative volume of factory pay roll. The instability in the demand for durable goods has increased significance when considered in the light of the relatively greater influence that their manufacture exerts on the wage receipts of factory labor and on the entire sequence of manufacturing operations.

One of the more striking contrasts revealed in the study is the relatively small percentage of the sum received for the fabrication of transient consumption goods that is disbursed in the form of wages and salaries. Only 38 per cent of value added was paid as wages or salaries in this group in 1929. In other groups roughly 50 per cent of value added was paid to employees, the highest percentages being in the capital and construction goods groups. The significance of this relationship is obscured somewhat since we cannot trace the destinations of the payments for items of overhead, and since a somewhat greater percentage of the original sales price is paid, relative to other groups, for materials consumed

in manufacture. It would appear, however, that an original expenditure on other types of manufactured goods might have a more immediate ramification throughout the economic system. If so, the relationship observed probably operates to retard business recovery and to accelerate the later phases of business expansion, for the relative expenditure on transient goods (foods being one major component) is greatest during periods of business depression.

The rather limited significance of the construction materials industries, as distinct from other capital goods in the manufactures total, is not without import. Granted the relatively close resemblance to the capital group in the pattern of costs and in the use made of different productive factors, the lower absolute level of the totals for construction materials (less than one-half that of capital goods in 1929) sets limits on the significance of the construction industry so far as manufacturing activity is concerned. In size, the construction materials group in manufacturing ranks with the automobile and related products subgroup of consumers' goods.

The growth of the automotive industry and the manufacturing activities it occasions vividly illustrates the changing structural composition of manufacturing and the changing "harvest of enjoyment". Index numbers have long testified to the exceptional growth of these industries but it is nonetheless striking to find approximately one-tenth of all wage earners and an equally large percentage of total capital contributing, at some stage of the manufacturing process, to the output of what is relatively a new consumers' service. The operation of the manufacturing system today is colored by the growth to maturity of the components of this major group of consumption goods industries.

No attempt has been made to establish norms for a satisfactorily operating economy. A rigid scheme of allocation of productive resources can hardly be relied upon to provide a

practical basis of control. Studies of the changing pattern of production, however, should further the understanding of conditions favorable to economic stability. Such studies, covering wide areas of the economic system and relating to successive periods, would seem to be prerequisite to a far-seeing consideration of actual and desirable ways of utilizing the nation's economic resources. This cross-section view of manufacturing production in 1929 is a step in this direction.

Appendix I

Classification of Manufacturing Industries, 1929

Table 1 contains the complete industry title, the Bureau of Census industry number (1929), and symbols indicating how and in what proportions the industry totals have been allocated according to the four classification schemes discussed in the text. In most instances the appropriate classification of a particular industry is indicated by the Census description of its products. The divisions between unfinished and finished products (Classification A) are based for the most part on data published by the Bureau of the Census in *Distribution of Sales of Manufacturing Plants*, and parallel similar classifications by Simon Kuznets in the National Bureau studies of capital formation. Certain exceptions to Dr. Kuznets' classifications, chiefly the classification as 'finished' of producers' supplies consumed outside the manufacturing system, are indicated in the text and in Appendix IV. Divisions of an industry total according to the ultimate use made of the industry's product (Classification C) are explained in column 7 of the table and, for certain industries, in detailed notes.

In general the classification of an industry is based upon the character of the major commodities produced. Whenever the industry's products fall into two or more categories of a particular classification scheme, the industry is included in each division with weights determined by commodity totals. Since the industry's secondary products are not included in these commodity totals, although similar products of other industries are, the basis of classification is not entirely satisfactory. Nevertheless, it is thought that this discrepancy does not introduce

any serious error. When the analysis is based on the reported distribution of sales, or where special industry data are available, the discrepancies between industry and commodity data are unimportant.

Classification

A Stage of Fabrication

Key 1 Finished
2 Unfinished

B Durability in Use

Key 1 Durable
2 Semidurable
3 Transient

C Character of Ultimate Use

Key 1 Consumption goods
11 Foods, tobacco, beverages
12 Wearing apparel and personal equipment
13 House furnishings and household supplies
14 Publications
15 Transportation
a Motor cars
b Gasoline and oil
c Rubber tires
d Other
16 Fuel and lighting
17 Drugs, medicines, and sundries
18 Recreation
2 Construction materials
3 Capital equipment
4 Producers' supplies
41 Producers' fuels and materials
42 Containers
43 Other producers' supplies

D Chief Source of Material

Key 1 Agricultural
- 11 Farm, except animal
- 12 Animal

2 Nonagricultural
- 21 Forest
- 22 Mineral
  - a Metal
  - b Nonmetal

3 Mixed

Alternate Classification (D)

Key A Vegetable
- B Animal
- C Fibres
- D Wood
- E Iron
- F Nonferrous metal
- G Nonmetallic mineral
- H Chemicals

Table 1

Entries in columns (3), (4), (5), (6) are explained in the preceding description of the classification schemes employed. Where more than one entry is made, the first of each pair of figures represents the classification group, the second (following the colon) represents the percentage of the industry total identified with that group. The symbols in column (7) refer to the chief basis for the estimated industry divisions in column 5 (classification according to ultimate use). The key to these symbols is as follows: C, division based on commodity tables of the Census of Manufactures, 1929; D, *Distribution of Sales of Manufacturing Plants, 1929* (Bureau of the Census); F, *Facts and Figures of the Automobile Industry* (National Automobile Chamber of Commerce, 1929); I, Industry information, much of it unpublished; K, data from the National Bureau study of capital formation conducted by Simon Kuznets; L, *High Level Consumption* by W. H. Lough and M. R. Gainsbrugh; M, Materials consumed as reported in the Census of Manufactures, 1929; R, *Mineral Resources of the United States* (Bureau of Mines); Z, approximate division, based on no statistical evidence. Lower case letters refer to detailed descriptions for selected industries given at the end of the table. Numbers refer to specific publications listed at the end of the table.

		CLASSIFICATION				
		A	B	C	D	
Industry No. (1)	Industry (2)	Stage of fabrication (3)	Durability in use (4)	Character of ultimate use (5)	Chief source of material (6)	Notes on Classification C (7)
	Food and Kindred Products					
101	Beverages	1	3	11	11A	
102	Bread and other bakery products	1	3	11	11A	
103	Butter	1:96,2:4	3	11	12B	
104	Canning and preserving: Fish, crabs, shrimps, oysters, and clams	1	3	11	12B	
105	Canning and preserving: Fruits and vegetables; pickles, jellies, preserves, and sauces	1	3	11	11A	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
106	Cereal preparations	1	3	11	11A	
107	Cheese	1	3	11	12B	
108	Chewing gum	1	3	11	11A	
109	Chocolate and cocoa products, not incl. confectionery	1:75,2:25	3	11	11A	
110	Coffee and spice, roasting and grinding	1	3	11	11A	
111	Condensed and evaporated milk	1:71,2:29	3	11	12B	
112	Confectionery	1	3	11	11A	
113	Corn sirup, corn sugar, corn oil, and starch	1:56,2:44	3	11	11A	
114	Feeds, prepared, for animals and fowls	2	3	41	11A	
115	Flavoring extracts and flavoring sirups	1:75,2:25	3	11	11A	
116	Flour and other grain mill products	1:50,2:50	3	11	11A	
117	Food preparations, n.e.c.	1	3	11	11A	
118	Ice cream	1	3	11	12B	
119	Ice, mfd.	1:54,2:46	3	11:54,43:46	3	D
120	Shortenings (not incl. lard) and vegetable cooking oils	1:83,2:17	3	11	11A	
121	Macaroni, spaghetti, vermicelli, and noodles	1	3	11	11A	
122	Malt	1:46,2:54	3	11	11A	
123	Meat packing, wholesale	1:93,2: 7	2:4,3:96	11:96,12:4	12B	C
124	Oleomargarine, not made in meat packing establishments	1	3	11	11A	
125	Peanuts, walnuts, and other nuts, processed or shelled	1:92,2: 8	3	11	11A	
126	Poultry killing, dressing and packing, wholesale	1	3	11	12B	
127	Rice cleaning and polishing	1:82,2:18	3	11	11A	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
128	Sausage, meat pudding, headcheese, etc., and sausage casings, not made in meat packing establishments	1:90,2:10	3	11	12B	
129	Sugar, beet	1:68,2:32	3	11	11A	
130	Sugar, cane, not incl. products of refineries	1:68,2:32	3	11	11A	
131	Sugar refining, cane	1:68,2:32	3	11	11A	
132	Vinegar and cider	1:90,2:10	3	11	11A	
	Textiles and their Products					
201	Artificial leather	2	2	13:68,15a:32	11C	CF
202	Asphalted-felt-base floor covering	1	2	13	3	
203	*Awnings, tents, sails, and canvas covers	1	1	18:25,3:75	11C	I
204	*Bags, other than paper, not made in textile mills	2	2	3	11C	
205	*Belting other than leather and rubber, not made in textile mills	1	2	3	11C	
206	Carpets and rugs, rag	1	1	13	12C	
207	Carpets and rugs, wool, other than rag	1	1	13:77,3:23	12C	CI1
208	Clothing (except work clothing) men's, youths', and boys', n.e.c.	1:93,2:7	2	12	12C	
209	Clothing, men's, buttonholes	2	2	12	12C	
210	Clothing, women's, n.e.c.	1:94,2:6	2	12	11:75,12:25, C	
211	Clothing, work (incl. sheep-lined and blanket-lined work coats but not shirts), men's	1:93,2:7	2	12	11C	
212	Cloth sponging and refinishing	2	2	12	12C	
213	Collars, men's	1	2	12	11C	
214	Cordage and twine	2	2	43	11C	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
215	Corsets and allied garments	1	2	12	11C	
216	Cotton goods	1:33,2:67	2	12:61,13:23 15a:8,3:4, 43:4	11C	CI1
217	Cotton small wares	1:33,2:67	2	12:95,3:5	11C	C
218	Dyeing and finishing textiles	2	2	12:80,13:20	3	I1
219	Embroideries	2	2	12	11C	
220	Felt goods, wool, hair, or jute	2	1	12:50,3:50	12C	C
221	Flags and banners	1	2	43	11C	
222	Flax and hemp, dressed	2	2	12:50,13:50	11C	Z
223	Furnishing goods, men's, n.e.c.	1	2	12	11C	
224	Gloves and mittens, cloth or cloth and leather combined, made from purchased fabrics	1	2	12	11C	
225	Haircloth	2	2	12:40,13:60	3	C
226	Handkerchiefs	1	2	12	11C	
227	Hat and cap materials, men's	2	2	12	12C	
228	Hats and caps, except felt and straw, men's	1	2	12	11:50 12:50 C	
229	Hats, fur-felt	1:75,2:25	2	12	12C	
230	Hats, wool-felt	1:60,2:40	2	12	12C	
231	*Horse blankets, fly nets, and related products	1	1	3	11C	
232	House-furnishing goods, n.e.c.	1	2	13	11C	
233	Jute goods	2	2	43	11C	
234	Knit goods	1:94,2: 6	2	12	11:80 12:20 C	
235	Lace goods	1:75,2:25	2	12:43,13:57	11C	C
236	Linen goods	1:58,2:42	2	12:50,13:50	11C	Z
237	Linoleum	1	2	13:60, 3:40	3	I
238	Mats and matting, grass and coir	1	1	13	11C	
239	Millinery	1:91,2: 9	2	12	3	
240	*Nets and seines	1	2	3	11C	
241	Oilcloth	1	2	13	11C	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
242	Regalia, badges, and emblems	1	1	18	11C	
243	Shirts	1:92,2: 8	2	12	11C	
244	Silk and rayon mfrs.	1:25,2:75	2	12:99,13: 1	3	CI1
245	Suspenders, garters, and other elastic woven goods, made from purchased webbing	1	2	12	11C	
246	Trimmings (not made in textile mills) and stamped art goods for embroidering	1:41,2:59	2	12	11C	
247	Upholstering materials, n.e.c.	2	1	13	3	
248	Waste	2	3	43	11C	
249	Woolen goods	1:13,2:87	2	12:87,13: 4 15a:9	12C	CF
250	Wool pulling	2	2	12	12C	
251	Wool scouring	2	2	12	12C	
252	Wool shoddy	2	2	12	12C	
253	Worsted goods	1:13,2:87	2	12:87,13: 4 15a:9	12C	CF
	Forest Products					
301	Baskets and rattan and willow ware, not incl. furniture	1	3	42	21D	C
302	*Billiard and pool tables, bowling alleys, and accessories	1	1	18:33, 3:67	21D	CZ
303	Boxes, cigar, wooden	2	3	42	21D	
304	Boxes, wooden, except cigar boxes	2	3	42	21D	
305	Caskets, coffins, burial cases, and other morticians' goods	1	3	12	21D	
306	*Cooperage	2	1:50,3:50	3:50,42:50	21D	C
307	Cork products	2	1:40,2:30 3:30	13:30, 2:40 42:30	21D	C
308	Excelsior	2	3	42	21D	
309	Furniture, incl. store and office fixtures	1	1	13:72, 3:28	21D	C
310	*Lasts and related products	1	1	3	21D	C

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
311	*Lumber and timber products, n.e.c.	2	1:83,3:17	12:1,13:5 14:1,15a:2 18:1,2:50 3:24,42:16	21D	a
312	Matches	1	3	11	21D	
313	Mirror and picture frames	1	1	13	21D	
314	Planing-mill products (incl. general millwork) not made in planing mills connected with sawmills	2	1	2	21D	
315	Pulp goods	2	2	13	21D	
316	Refrigerators and refrigerator cabinets, excl. mechanical refrigerating equipment	1:60,2:40	1	13:68,3:32	21D	C
317	Turpentine and rosin	2	2:77,3:23	12:2,13:16 14:23,2:50 43:9	21D	C2
318	Window and door screens and weather strip	1	1	2	21D	
319	*Wood preserving	2	1	2	21D	
320	Wood turned and shaped and other wooden goods, n.e.c.	1:26,2:74	1	13:49,15d:2 18:4,3:45	21D	C
	Paper and allied Products					
401	Bags, paper, excl. those made in paper mills	2	3	42	21D	
402	Boxes, paper, n.e.c.	2	3	42	21D	
403	Cardboard, not made in paper mills	2	3	42	21D	
404	Card cutting and designing	2	2	43	21D	
405	Envelopes	1:20,2:80	3	13:20,43:80	21D	C
406	Labels and tags	2	3	43	21D	
407	Paper	1:10,2:90	2:4,3:96	13:12,14:28 2: 4,43:56	21D	
408	Paper goods, n.e.c.	1:50,2:50	3	13:50,14:18 43:32	21D	C

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)	
410	Pulp (wood and other fiber)	2	2:4,3:96	13:12,14:28 2: 4,43:56	21D		
411	Wall paper	2	2	2	21D		
	Printing, Publishing, and allied Industries						
501	Bookbinding and blank-book making	1:33,2:67	3	14	21D		
502	Engravers' materials	2	3	43	3		
503	*Engraving (other than steel, copperplate, or wood), chasing, etching, and diesinking	2	1	3	22aF		
504	Engraving, steel and copperplate, and plate printing	2	3	14	22a, E;50,F;50		
505	Engraving, wood	2	3	14	21D		
506	Lithographing	2	3	14	3		
507	Photo-engraving, not done in printing establishments	2	3	14	22aF		
508	Printing and publishing, book and job	1:21,2:79	3	14:21,43:79	21D	CD	
509	Printing and publishing, music	1	3	14	21D		
510	Printing and publishing, newspaper and periodical	1	3	14	21D		
511	*Printing materials, not incl. type or ink	1	1	3	22aE		
512	Stereotyping and electrotyping, not done in printing establishments	2	3	14	22aF		
513	*Type founding	2	1	3	22aF		
	Chemicals and allied Products						
601	Alcohol, ethyl, and distilled liquors	1:43,2:57	1:3,2:8 3:89	11:20,12: 3 13: 3,15a:36 17: 8, 2: 5 41:25	11A	b	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
602	Ammunition and related products	1	3	18:70,41:30	22aF	C
603	Baking powders, yeast, and other leavening compounds	1:56,2:44	3	11	11A	
604	Blacking, stains, and dressings	1	3	12:75,43:25	3	DS
605	Bluing	1	3	13	22bH	
606	Bone black, carbon black, and lampblack	2	2:70,3:30	11:12,14:18 15c:63,2:7	22bG	CR
607	Candles	1	3	13:40,43:60	12B	D
608	Chemicals, n.e.c.	1:8,2:92	1:5,2:26 3:69	11:2,12:24 13:4,14:1 15a:1,15b:2 2:2,3:5 41:58,42:1	3	c
609	Cleaning and polishing preparations	1:82,2:18	3	13	22bH	
610	Compressed and liquefied gases	2	3	41	22bH	
611	Druggists' preparations	1	3	17	3	
612	Drug grinding	2	3	17	3	
613	Explosives	2	1:13,3:87	18:10,2:13 41:77	22bH	C_3
614	Fertilizers	2	3	41	22bH	
615	Fireworks	1	3	18	22bH	
616	Glue and gelatin	2	3	11:23,43:77	12B	C
617	Grease and tallow, not incl. lubricating greases	2	3	13:67,43:33	12B 22bH	C_4
618	Ink, printing	2	3	43	22bH	K
619	Ink, writing	1:90,2:10	3	13:90,43:10	11A	
620	Liquors, vinous	1:67,2:33	3	17		
621	Mucilage, paste, and other adhesives, except glue and rubber cement	1:52,2:48	3	13:52,43:48	3	K
622	Oil, cake, and meal, cottonseed	2	2:11,3:89	11:46,12:11 13:4,41:39	11A	C_5
623	Oil, cake, and meal, linseed	1:50,2:50	2:63,3:37	13:5,2:58 43:37	11A	C_5
624	Oils, essential	2	3	17	21D	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
625	Oils, n.e.c.	2	2:4,3:96	11:27,12:15 13:35,2:4, 43:19	3	C6
626	Paints and varnishes	1:10,2:90	2	13:18,15a:11 15c:3,2:68	3	CR
627	Patent or proprietary medicines and compounds	1	3	17	3	
628	Perfumes, cosmetics, and other toilet preparations	1	2	12	3	
629	Rayon and allied products	2	2	12	11C:50 21D:50	
630	Salt	1:20,2:80	3	11:20,43:80	22bG	K7
631	Soap	1:90,2:10	3	12:27,13:73	3	CI
632	Tanning materials, natural dyestuffs, mordants and assistants, and sizes	2	2	12	21D	
633	Wood distillation and charcoal manufacture	2	3	41	21D	
	Products of Petroleum and Coal					
701	Coke, not incl. gashouse coke	1:20,2:80	1:80,3:20	16:20,41:80	22bG	CR
702	Fuel, briquettes and boulets	1	3	16	22bG	
703	Gas, mfd., illuminating and heating	1:78,2:22	3	16:78,41:22	22bG	CR
704	Lubricating oils and greases, not made in petroleum refineries	1:28,2:72	3	15b:28,41:72	22bG	CR8
705	Petroleum refining	1:46,2:54	2:2,3:98	15b:41,16:7 2:2,41:50	22bG	CR8
	Rubber Products					
801	Boots and shoes, rubber	1	2	12	21D	CI
802	Rubber goods, other than tires, inner tubes, and boots and shoes	1:20,2:80	2	12:23,13:10 15a:16,17:5 18:3,3:43	21D	
803	Rubber tires and inner tubes	1:69,2:31	2	12:3,13:2 15a:2,15c:88 3:5	21D	CI

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
	Leather and its Manufactures					
901	*Belting, leather	1	1	3	12B	
902	Boot and shoe cut stock, not made in boot and shoe factories	2	2	12	12B	
903	Boot and shoe findings, not made in boot and shoe factories	2	2	12	3	
904	Boots and shoes, other than rubber	1	2	12	12B	
905	Gloves and mittens, leather	1	2	12	12B	
906	Leather goods, n.e.c.	1:80,2:20	2	12	12B	
907	Leather: Tanned, curried, and finished	2	2	12:85,13:7 3:8	12B	C
908	Pocketbooks, purses, and cardcases	1	2	12	12B	
909	*Saddlery and harness	1	1	15d:25,3:75	12B	DL
910	Trunks, suitcases, and bags	1	1	12	12B	
	Stone, Clay, and Glass Products					
1001	Asbestos products, other than steam packing or pipe and boiler covering	2	1:40,2:60	15a:40, 2:40,3:20	22bG	C
1002	*Cement	2	1	2	22bG	C
1003	China firing and decorating, not done in potteries	1	1	13	22bG	
1004	Clay products (other than pottery) and nonclay refractories	2	1:75,2:25	2:75,43:25	22bG	C
1005	Concrete products	2	1	2	22bG	
1006	*Crucibles	1	1	3	22bG	
1007	*Emery wheels and other abrasive and polishing appliances	1	1	3	22bG	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1008	Glass	1:25,2:75	1:43,2:25 3:32	13:25,15a:13 2:17,3:13 42:32	22bG	CFI
1009	Glass products (except mirrors) made from purchased glass	1:31,2:69	1	13:50,2:50	22bG	CSZ9
1010	*Graphite, ground and refined	2	1:65,2:8 3:27	13:15,2:8 3:65,43:12	22bG	R
1012	*Hones, whetstones, and similar products	1	1	3	22bG	
1013	Lime	2	1:91,3:9	14:9,2:44 3:11,41:36	22bG	R
1014	Marble, granite, slate, and other stone products	1:32,2:68	1	2	22bG	C
1015	Minerals and earths, ground or otherwise treated	2	3	41	22bG	
1016	Mirrors, framed and unframed	1:61,2:39	1	13:61,3:39	22bG	K
1017	Pottery, incl. porcelain ware	1:54,2:46	1	13:43,2:45 3:12	22bG	C
1018	Sand-line brick	2	1	2	22bG	
1019	Statuary and art goods, factory product	1:34,2:66	1	13	22bG	
1020	Wall plaster, wall board, and floor composition	2	1	2	22bG	
	Iron and Steel and their Products, not incl. Machinery					
1101	*Bolts, nuts, washers, and rivets, not made in rolling mills	2	1	2:76,3:24	22aE	C
1102	*Cast-iron pipe	2	1	2	22aE	
1103	Cutlery (not incl. silver and plated cutlery) and edge tools	1	1:50,3:50	12:50,13:22 3:28	22aE	C
1104	Doors, shutters, and window sash and frames, metal	2	1	2	22aE	
1105	Files	1	2	43	22aE	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1106	Firearms	1	1	18	22aE	
1107	*Forgings, iron and steel, not made in rolling mills	2	1	3	22aE	
1108	Galvanizing and other coating, not done in rolling mills	2	1	2	22aE	
1109	Hardware, n.e.c.	1:18,2:82	1	13:46,15a:28 2:26	22aE	Cl
1110	*Iron and steel: Blast furnaces	2	1:93,3:7	13:4,15a:15 2:27,3:47 42:7	22aE	Md
1111	*Iron and steel, processed	2	1	3	22aE	
1112	*Iron and steel: Steel works and rolling mills	2	1:92,3:8	13:4,15a:15 2:28,3:45 42:8	22aE	e
1113	Nails, spikes, etc., not made in rolling mills or wire mills	2	1	2	22aE	
1114	Plumbers' supplies, not incl. pipe or vitreous-china sanitary ware	2	1	2	22a E:50,F:50	
1115	*Safes and vaults	1	1	3	22aE	
1116	*Saws	1	1	3	22aE	
1117	*Screw-machine products and wood screws	2	1	2:12,3:88	22aE	C
1118	Springs, steel, except wire, not made in rolling mills	2	1	15a:77,3:23	22aE	C10
1119	Steam fittings and steam and hot-water heating apparatus	2	1	2	22aE	
1120	*Steel barrels, kegs, and drums	1	1	3	22aE	
1121	Stoves and ranges (other than electric) and warm-air furnaces	1	1	13	22aE	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1122	*Structural and ornamental iron and steel work, not made in rolling mills	2	1	2	22aE	
1123	Tin cans and other tinware, n.e.c.	2	1:2,2:2, 3:96	13:2,3:2, 42:96	22a	C
1125	*Tools, not incl. edge tools, machine tools, files, or saws	1	1	3	22aE	
1126	*Wire, drawn from purchased bars or rods	1:11,2:89	1	13:2,2:21 3:77	22a E:33,F:67	C
1127	*Wirework, n.e.c.	1:10,2:90	1	13:38,15a:8 2:12,3:42	22aE	C10
1128	*Wrought pipe, welded and heavy riveted, not made in rolling mills	2	1	2:68,3:32	22aE	C
	Nonferrous Metals and their Products					
1201	Aluminum mfrs.	1:22,2:78	1	13:30,15a:25 2:8,3:37	22aF	CRF
1202	Clocks, clock movements, time-recording devices, and time stamps	1	1	13:74,15a:6 3:20	22aF	C
1203	Collapsible tubes	2	3	42	22aF	
1204	Copper, tin, and sheet-iron work, incl. galvanized-iron work, n.e.c.	2	1	2	22aF	
1205	Electroplating	2	1	13:50,15a:50	22aF	Z
1206	*Fire extinguishers, chemical	1	1	3	22aF	
1207	Gas and electric fixtures; lamps, lanterns, and reflectors	1:20,2:80	1	13:48,15a:25 3:27	22aF	C
1208	*Gold leaf and foil	2	1	3	22aF	
1209	Gold, silver, and platinum, reducing and refining, not from the ore	2	1	12	22aF	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1210	Jewelry	1:87,2:13	1	12	22aF	
1211	Needles, pins, hooks and eyes, and snap fasteners	1:38,2:62	2	12:76,3:24	22aF	CK
1212	*Nonferrous-metal alloys and products, not incl. aluminum products	2	1	13:5,15a:16 2:17,3:62	22aF	f
1213	Plated ware	1	1	13:90,3:10	22aF	C
1214	Silversmithing and silverware	1	1	13	22aF	
1215	*Smelting and refining, copper	2	1	12:2,13:5 15a:15,2:16 3:62	22aF	g
1216	*Smelting and refining, lead	2	1:95,3:5	12:2,13:5 15a:19,18:3 2:22,3:44 42:5	22aF	h
1217	*Smelting and refining, metals other than gold, silver, or platinum, not from the ore	2	1:93,3:7	13:4,15a:17 2:17,3:55 42:7	22aF	i
1218	*Smelting and refining, zinc	2	1	12:1,13:7 15a:10,18:1 2:40,3:40 41:1	22aF	j
1219	Stamped ware, enameled ware, and metal stamping, enameling, japaning, and lacquering	1:34,2:66	1:87,3:13	13:60,15a:27 42:13	22aF	C
1220	Tin and other foils, not incl. gold foil	2	3	42	22aF	
1221	Watch and clock materials and parts, except watchcases	1:50,2:50	1	12:50,13:50	22aF	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1222	Watchcases	1	1	12	22aF	
1223	Watches and watch movements	1	1	12	22aF	
	Machinery, not incl. Transportation Equipment					
1301	*Agricultural implements	1	1	3	22aE	
1302	*Cash registers, adding, calculating, and card-tabulating machines	1	1	3	22aE	
1303	*Electrical machinery, apparatus, and supplies	1:70,2:30	1:98,2:2	13:31,15a:9 2:16,3:42 43:2	22a E:33,F:67	
1304	*Engines, turbines, tractors, and water wheels	1:75,2:25	1	15a:11,18:4 3:85	22aE	C19,11
1305	*Foundry and machine-shop products, n.e.c.	1:50,2:50	1	15a:5,2:3 3:92	22aE	C
1306	*Gas machines, gas meters, water and other liquid meters	1	1	3	22aE	
1307	*Machine tools	1	1	3	22aE	
1309	*Pumps (hand and power) and pumping equipment	1	1	13:10,3:90	22aE	C
1310	Refrigerators, mechanical	1:93,2:7	1	13:91,3:9	22aE	K
1311	*Scales and balances	1	1	3	22aE	
1312	Sewing machines and attachments	1:78,2:22	1	13:71,3:29	22aE	C
1313	*Textile machinery and parts	1	1	3	22aE	
1314	*Typewriters and parts	1	1	13:16,3:84	22aE	C9
1315	Washing machines, wringers, driers, and ironing machines, for household use	1	1	13	22aE	
1316	*Windmills and windmill towers	1	1	2	22aE	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1318	*Machine-tool accessories and small metal-working tools, n.e.c.	1	1	3	22aE	
	Transportation Equipment, Air, Land, and Water					
1401	*Aircraft and parts	1	1	15d:40,3:60	22aE	CD12
1402	*Carriage, wagon, sleigh, and sled materials	2	1	3	21D	
1403	Carriages and sleds, children's	1	1	18	3	
1404	*Carriages, wagons, sleighs, and sleds	1	1	3	21D	
1405	*Cars, electric and steam railroad, not built in railroad repair shops	1	1	3	22aE	
1406	*Locomotives, not made in railroad repair shops	1	1	3	22aE	
1407	Motor-vehicle bodies and motor-vehicle parts	1:17,2:83	1	15a:85,3:15	22aE	Ck
1408	Motor vehicles, not incl. motor cycles	1	1	15a:82,3:18	22aE	Kk
1409	Motor cycles, bicycles, and parts	1:86,2:14	1	15d	22aE	K
1410	*Ship and boat building, steel and wooden, incl. repair work	1:38,2:62	1	18:12,3:88	21:30, 22a:70 D:30,E:70	CD
	Railroad Repair Shops					
1501	*Car and general construction and repairs, electric-railroad repair shops	1	1	3	22aE	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1502	*Car and general construction and repairs, steam-railroad repair shops	1	1	3	22aE	
	Miscellaneous Industries					
1601	Artificial and preserved flowers and plants	1:25,2:75	2	12:25,13:75	11C	K
1603	Artists' materials	1	2	18:50,43:50	3	Z
1604	Brooms	1	2	13:89,3:11	11A	C
1605	Brushes, other than rubber	1	2	12:26,13:38 3:36	12B	C
1606	Buttons	2	2	12	3	
1607	Carbon paper and inked ribbons	2	3	43	3	
1608	Cigars and cigarettes	1	3	11	11A	
1609	Combs and hairpins, not made from metal or rubber	1	2	12	3	
1610	*Dairymen's supplies; creamery, cheese-factory, and butter-factory equipment; and poultry-men's and apiarists' supplies	1	1	3	22aE	
1611	Dental goods and equipment	1	1:78,2:22	12:64,3:14 43:22	3	C
1612	Fancy and misc. articles, n.e.c.	1	3	13	3	
1613	Feathers, plumes, and mfrs. thereof	1:33,2:67	2	12	12B	
1614	*Foundry supplies	2	2	43	3	
1615	Fur goods	1:58,2:42	2	12	12B	
1616	Furs, dressed	2	2	12	12B	
1617	Hair work	1	1	12	3	
1618	*Hand stamps and stencils and brands	1	1	3	22aE	
1619	Hats, straw, men's	1	2	12	11A	
1620	*Instruments, professional and scientific	1:77,2:23	1	3	3	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1621	Ivory, shell, and bone work, not incl. buttons, combs, or hairpins	1:25,2:75	1	13	3	
1622	Jewelry and instrument cases	1:10,2:90	1	12	3	
1623	Lapidary work	2	1	12	22bG	
1624	Mattresses and bed springs, n.e.c.	1	1	13	3	
1625	*Models and patterns, not incl. paper patterns	1	1	3	21D	
1626	Motion pictures, not incl. projection in theaters	1	3	18	3	
1627	Musical instrument parts and materials: piano and organ	2	1	13	3	
1628	Musical instruments and parts and materials, n.e.c.	1	1	18	3	
1629	Musical instruments: Organs	1	1	18	22aF	
1630	Musical instruments: Pianos	1	1	13	3	
1631	Optical goods	1:64,2:36	1	12	3	
1632	*Paving materials: Asphalt, tar, crushed slag, and mixtures	2	1	2	22bH	
1633	Pencils, lead (incl. mechanical)	1:76,2:24	3	13:76,43:24	3	K
1634	Pens, fountain and stylographic; pen points, gold, steel, and brass	1	1:95,2:5	12:95,43:5	3	C
1635	Phonographs	1	1	13	3	
1636	Phonographic apparatus and materials	1:41,2:59	1:21,3:79	18:36,3:5 43:59	3	KI
1637	Pipes (tobacco)	1	1	12	21D	
1638	Roofing, built-up and roll; asphalt shingles; roof coatings other than paint	2	1	2	22bH	

Industry No. (1)	Industry (2)	CLASSIFICATION A Stage of fabrication (3)	B Durability in use (4)	C Character of ultimate use (5)	D Chief source of material (6)	Notes on Classification C (7)
1639	Sandpaper, emery paper, and other abrasive paper and cloth	2	1:50,3:50	2:50,43:50	3	D
1640	*Signs and advertising novelties	1	1:66,3:34	3:66,43:34	3	C
1641	*Soda-water apparatus	1	1	3	3	
1642	Sporting and athletic goods, not incl. firearms or ammunition	1	2	18	3	
1643	Stationery goods, n.e.c.	1:80,2:20	2	13	3	
1644	Steam and other packing, pipe and boiler covering, and gaskets, n.e.c.	2	2	15a:19,3:27 43:54	3	C
1645	Surgical and orthopedic appliances, incl. artificial limbs	1	1	12	3	
1646	*Theatrical scenery and stage equipment	1	1	3	3	
1647	Tobacco: chewing and smoking, and snuff	1	3	11	11A	
1648	Toys (not incl. children's wheel goods or sleds), games, and playground equipment	1	2	18	3	
1649	Umbrellas, parasols, and canes	1	1	12	3	
1650	*Whips	1	1	3	12B	
1651	Window shades and fixtures	1	2	13	3	

* Industries classed as dominantly capital producing in the frequency distributions of Ch. III. Lumber (No. 311) and electrical machinery, apparatus, and supplies (No. 1303) are included with half weight.

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2 *Agricultural Yearbook, 1932*, p. 384

3 *Production of Explosives in the United States in 1931*, Bureau of Mines, Technical Paper #540
4 *Report to Congress on Certain Vegetable Oils, Whale Oil and Copra*, U.S. Tariff Commission, #41, 2d series, 1932, pp. 8, 31
5 *Animal and Vegetable Fats and Oils*, U.S. Department of Commerce, 1935, p. 25
6 Same as 4 above, p. 31
7 *Production and Distribution of Salt in the United States by Primary Producers*, U.S. Tariff Commission (mimeographed), 1935
8 *Petroleum Investigation. Hearings before Committee on Interstate and Foreign Commerce*, H. Res. 441, Part I, p. 121, Washington, 1934
9 *Census of Manufactures, 1931*
10 *Census of Manufactures, 1927*
11 *Agricultural Yearbook, 1930*, pp. 1040–1
12 Air Commerce *Bulletin*, Vol. 4, May 1933, p. 533; also article on 'Aviation,' *Encyclopedia of the Social Sciences*, Vol. 2, p. 361

NOTES

a *Lumber and timber products, n.e.c.* (311)

Minor lumber products (lath, shingles, firewood, pulpwood, fence posts, poles, etc.) are reported by the Bureau of the Census and have been classified according to their dominant use. The values of railroad ties and mine timbers are estimated on the basis of partial data. The value of lumber cut was estimated from the quantity produced, which was apportioned 37.3 per cent used in manufactures, other than building (based on data in *Lumber Used in Manufactures, 1928*, U.S. Department of Agriculture, Forest Service, adjusted to 1929 on the basis of production index), 4.5 per cent as net exports, and the rest, 58.2 per cent, to building use. An estimated value added by planing mills operated in conjunction with sawmills ($62 million: value of product less lumber consumed times average price at mill) was likewise so apportioned. The amount used in manufacturing industries other than planing mills was further al-

located according to ultimate uses, as indicated by a detailed classification of the 60 consuming industries reported in *Lumber Used in Manufactures, 1928*. Finally, all value estimates were cumulated according to the ultimate use of the product and percentages of the grand total computed.

b *Alcohol, ethyl, and distilled liquors* (601)
All distilled liquors were classified as C11. Of total completely denatured alcohol, we estimate 35,000 wine gallons consumed as an anti-freeze (C15a), 5,000 wine gallons diverted for beverage (C11) purposes (cf. p. 13, *Whiskey, Wine, Beer and other Alcoholic Beverages and the Tariff*, U.S. Tariff Commission Report #90), the rest used for general supply and fuel (C41). Specially denatured alcohol has been allocated among various uses in accordance with estimates for 39 industrial uses for the fiscal year 1929–30 given in *Statistics Concerning Intoxicating Liquors, 1933*, Tables 19 and 26. Cumulated totals for all products, in terms of tax proof gallons, provide the proportions according to the seven groups listed above.

c *Chemicals, n.e.c.* (608)
Wherever information concerning the use of one of the hundred odd products classified in this group was not available, its value was classified as producers' supplies (C41). For major products (sulphuric acid, soda ash, caustic soda, chlorine) data on industrial consumption are available and were utilized to apportion the commodity totals. Useful information was found in the files of *Chemical and Metallurgical Engineering*.

d *Iron and steel: blast furnaces* (1110)
See *Census of Manufactures, 1929*, p. 940; also note e below, and allocation ratios for other industries indicated in the Census as consumers of blast furnace products.

e *Iron and steel: steel works and rolling mills* (1112)
Certain products of steel works and rolling mills can be allocated according to ultimate use with little or no difficulty; e.g., rails, etc. (C3) or shapes (C2). Other products such as bars; plates;

sheets; ties, hoops, banks, and strips; cold rolled strips; cold rolled bars, wire rods were independently allocated to different uses on the basis of shipments of 54 major companies in 1929, analyzed by 17 types of steel product and 22 [different] consumer groups (*Iron Age*, January 2, 1930, p. 11). The percentages are based on cumulated values of different products, each analyzed in the manner described.

f *Nonferrous metal alloys and products* (1212)
See note g. Same distribution used as for copper.

g *Smelting and refining: copper* (1215)
The nonferrous metals are inextricably mixed. The Census industry, 'Smelting and refining: copper,' covers all nonferrous metals found in the copper ore. The percentages reported in the *Census of Mines, 1930* for copper are accepted: 93.5, copper; .5, lead; .9, zinc; 2.4, gold; 2.7, silver. The .5 per cent lead is divided .2 C15a and .3 C3; the .9 zinc is classified C3. The 2.4 per cent gold is divided 1.3 C12 (54.5 per cent of all gold used in arts) and 1.1 C3. The 2.7 per cent silver is divided .2 C12, .8 C13, 1.7 C3 on the basis of data in *Consumption of Silver in the Arts and Industries of the United States* (Economic Paper 14, Bureau of Mines, 1932), and an estimate of 50 per cent used for monetary purposes (C3), *Mineral Resources, 1929*, I, 878. Finally, the 93.7 per cent of the industry's product considered to be copper was apportioned in accordance with detailed estimates for 22 purposes reported in the *Yearbook of American Bureau of Metal Statistics, 1930*, p. 37. The cumulated fractional percentages give the figures in the table.

h *Smelting and refining: lead* (1216)
The method described in note g was used. Census of Mines gives the following percentages at the mine: copper 2.0 (classed as C3); lead 74.0; zinc 11.5; gold 1.8; (divided C12, C3); silver 10.6. The 74.0 per cent identified as lead was allocated on the basis of data for 17 consumer divisions, *Yearbook of American Bureau of Metal Statistics, 1930*. Two of these divisions, relating to uses of white lead and red lead and litharge

(except battery lead), were further apportioned on the basis of data in *Mineral Resources, 1929*, I, 511 ff. The 11.5 per cent classed as zinc was allocated in accordance with similar estimates for this metal (cf. note j); the 10.6 per cent in silver was divided as for copper (cf. note g).

i *Smelting and refining: metals other than gold, silver, or platinum, not from the ore* (1217)
Lead, copper, zinc as reported in tons were allocated according to commodity (cf. notes g, h, j). Tin was divided on the basis of Bureau of Mines *Information Circular: Tin* and *Facts and Figures of Automobile Industry*. Of the tin total, 60 per cent was classed as C42; 24 per cent as C15a, and the rest as C3. Brass and bronze were apportioned according to data compiled for zinc (cf. note j). Bearing metals were divided equally between C15a and C3; solders C42; type metals C3. Cumulated totals give the percentages of the table.

j *Smelting and refining: zinc* (1218)
See also notes g and h. The contents of zinc ore are reported by the Census of Mines to be copper 1.0 per cent (C3), lead 17.4 per cent (cf. note h), zinc 79.5 per cent, gold 0.6 per cent (C12), silver 1.5 per cent (cf. note g). The allocation of zinc according to its various uses is based on detailed consumption estimates for 1928 by W. R. Ingalls, *World Survey of the Zinc Industry, 1931*. Among these data are estimates for uses of brass and castings referred to in note i.

k *Motor vehicles* (1408)
All passenger motor vehicles other than buses or taxicabs were classed as consumption goods in the absence of data on the extent of their use by business concerns.

Appendix II

Selected Data relating to Individual Manufacturing Industries, 1929

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Selected Data relating to Individual Manufacturing Industries, 1929

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product: Cost of materials (5)	Percentage of Value of Product: Wages (6)	Percentage of Value of Product: Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*): Value of product (9)	Per Establishment (*thousands of dollars*): Value added (10)	Per Establishment (*thousands of dollars*): Wages (11)
1301	Agricultural implements	51.7	51.4	41	21	38	36	948	559	201
1401	Aircraft	48.4	47.8	38	31	31	50	539	332	166
601	Alcohol	55.8	53.0	65	4	31	11	1809	641	71
1201	Aluminum mfrs.	50.0	47.8	61	19	20	50	1023	396	198
602	Ammunition	52.3	49.6	45	19	36	35	2086	1141	394
1601	Artificial flowers	47.1	44.7	38	22	40	36	76	47	17
201	Artificial leather	48.9	46.0	68	12	20	37	1939	629	233
1603	Artists' materials	47.6	45.3	44	15	41	27	139	78	21
1001	Asbestos products	52.3	49.7	45	19	36	35	838	459	161
202	Asphalted floor coverings	54.2	51.1	45	11	44	20	2278	1258	250
203	Awnings, tents	48.6	45.8	51	17	32	36	49	24	9
204	Bags, not paper	49.4	46.6	85	6	9	37	714	128	48
401	Bags, paper	50.3	52.5	67	10	23	31	680	225	70
603	Baking powders	47.6	45.3	43	9	48	16	1090	620	101
301	Baskets	53.8	51.1	39	29	32	48	84	51	25
205	Belting, not leather or rubber	51.9	48.9	48	11	41	20	310	162	33
901	Belting, leather	50.2	46.0	58	10	32	24	172	72	17
101	Beverages	49.9	48.5	38	14	48	23	52	32	7
302	Billiard tables, accessories	51.2	48.6	37	21	42	33	221	140	47
604	Blacking	48.4	46.0	34	8	58	12	145	96	12
605	Bluing	44.7	42.5	34	8	58	12	68	45	5
1101	Bolts, nuts	53.2	50.5	43	22	35	38	875	497	189
606	Bone black	57.4	54.5	45	13	42	23	262	144	34

501	Bookbinding	47.2	46.2	30	31	39	44	93	65	29
902	Boot & shoe cut stock	48.4	43.8	81	8	11	40	635	123	49
903	Boot & shoe findings	49.2	44.6	55	19	26	41	153	70	29
904	Boots & shoes, not rubber	48.6	44.1	53	23	24	49	720	336	166
801	Boots & shoes, rubber	48.7	45.2	34	29	37	44	4661	3097	1361
303	Boxes, cigar	51.2	48.6	42	28	30	49	106	61	30
402	Boxes, paper	49.8	52.0	54	19	27	42	235	108	46
304	Boxes, wooden	53.1	50.4	55	22	23	48	170	77	37
102	Bread	50.3	49.3	48	18	34	35	73	38	13
1604	Brooms	49.0	46.5	50	22	28	44	47	23	10
1605	Brushes, not rubber	48.8	46.4	48	17	35	33	150	79	26
103	Butter	55.3	53.8	85	3	12	22	212	31	7
1606	Buttons	50.9	48.3	40	30	30	50	120	72	36
607	Candles	50.7	48.2	49	14	37	27	334	172	46
104	Canning, fish	49.3	48.0	66	11	23	32	232	79	25
105	Canning, fruits, vegetables	52.5	51.1	62	10	28	26	250	96	25
1501	Car shops, electric rr.	49.8	47.3	38	55	7	89	192	118	106
1502	Car shops, steam rr.	50.3	47.8	44	50	6	88	640	361	319
1607	Carbon paper	48.2	45.7	46	10	44	18	303	163	30
403	Cardboard	50.3	52.5	47	15	38	28	433	228	63
404	Card cutting	47.5	49.6	47	14	39	26	281	148	39
206	Carpets & rugs, rag	50.7	47.7	30	28	42	41	59	41	17
207	Carpets & rugs, wool	49.9	47.0	49	23	28	44	2641	1347	597
1402	Carriage materials	52.6	50.0	53	20	27	43	62	29	13
1403	Carriages & sleds, childrens	51.6	49.0	47	29	24	54	365	194	105
1404	Carriages, wagons	50.4	47.9	51	21	28	43	187	91	39
1405	Cars, rr.	50.9	48.4	68	19	13	61	2233	710	431
1302	Cash registers	50.8	49.6	10	27	63	30	2391	2157	647
305	Caskets	49.9	47.4	45	19	36	34	213	118	40
1102	Cast-iron pipe	52.2	49.6	43	28	29	49	1115	638	313
1002	Cement	56.8	56.6	36	18	46	28	1537	990	281
106	Cereal preparations	48.6	47.3	58	5	37	12	1448	610	73
107	Cheese	56.0	54.4	84	4	12	26	40	6	2
608	Chemicals, n.e.c.	53.0	54.6	49	13	38	25	1339	680	172
108	Chewing gum	48.6	47.3	39	5	56	7	1626	998	74
1003	China firing	47.8	45.4	41	27	32	46	58	34	16

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product Cost of materials (5)	Percentage of Value of Product Wages (6)	Percentage of Value of Product Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*) Value of product (9)	Per Establishment (*thousands of dollars*) Value added (10)	Per Establishment (*thousands of dollars*) Wages (11)
109	Chocolate products	50.6	49.3	67	7	26	19	2026	678	132
1608	Cigars, cigarettes	49.7	44.5	33	8	59	12	652	434	52
1004	Clay products	51.9	49.3	28	36	36	50	169	122	61
609	Cleaning preparations	48.6	46.2	38	7	55	11	118	73	8
1202	Clocks	49.4	47.0	25	30	45	40	753	562	223
208	Clothing, men's, n.e.c.	45.1	41.5	49	20	31	39	244	125	49
209	Clothing, men's, buttonholes	44.6	42.0	11	55	34	61	18	16	10
210	Clothing, women's, n.e.c.	44.8	42.2	55	14	31	31	212	96	30
211	Clothing, work, men's	47.0	43.2	60	19	21	49	271	107	52
212	Cloth sponging	44.8	42.2	3	43	54	45	73	71	32
110	Coffee, spice	49.0	47.7	78	2	20	12	457	99	11
701	Coke	52.3	49.7	68	8	24	25	2721	881	218
1203	Collapsible tubes	49.7	47.2	60	20	20	51	524	207	105
213	Collars, men's	48.4	45.6	42	26	32	44	583	341	151
1609	Combs, hairpins	48.6	46.2	41	26	33	43	103	62	27
610	Compressed gases	54.1	51.4	28	10	62	14	147	106	15
1005	Concrete products	50.4	47.9	37	24	39	39	38	24	9
111	Condensed milk	54.7	53.2	78	4	18	19	391	85	16
112	Confectionery	49.8	48.5	55	14	31	32	195	88	28
306	Cooperage	51.1	48.6	64	18	18	50	110	40	20
1204	Copper, tin and sheet iron work, n.e.c.	48.1	45.7	51	19	30	39	103	51	20
214	Cordage, twine	52.6	49.5	60	14	26	35	744	300	104
307	Cork products	53.0	50.4	55	18	27	40	658	298	120
113	Corn sirup, oil, starch	51.5	50.1	63	6	31	16	4742	1763	282
215	Corsets	47.0	44.2	47	16	37	31	361	191	58
216	Cotton goods	54.7	51.6	59	21	20	52	1190	489	253
217	Cotton small wares	50.2	47.3	52	24	24	49	323	156	76

1006	Crucibles	49.6	47.2	35	15	50	23	268	174	39
1103	Cutlery, edge tools	50.5	48.0	19	22	59	28	329	267	74
1610	Dairymen's supplies	51.5	48.9	39	16	45	27	246	150	40
1611	Dental goods	49.4	47.0	49	15	36	30	404	205	62
1104	Doors, shutters	47.9	45.5	42	24	34	41	488	284	115
611	Druggists' preparations	47.6	45.2	35	10	55	15	291	189	29
612	Drug grinding	50.0	47.5	59	9	32	21	372	154	32
218	Dyeing & finishing textiles	50.7	49.1	51	20	29	41	636	314	129
1303	Electrical machinery	48.8	47.6	42	20	38	34	1277	738	253
1205	Electroplating	48.9	46.4	20	40	40	50	44	35	18
219	Embroideries	47.0	44.3	26	31	43	42	31	23	10
1007	Emery wheels	50.9	48.4	39	18	43	29	480	295	87
1304	Engines, turbines	51.3	50.1	44	22	34	39	2298	1278	496
502	Engravers' materials	49.0	48.0	57	14	29	34	165	70	24
503	Engraving, chasing, n.e.c.	48.0	47.0	24	29	47	38	58	44	17
504	Engraving, steel & copper plate	46.4	45.4	25	31	44	41	103	77	32
505	Engraving, wood	45.0	44.1	11	44	45	49	27	24	12
405	Envelopes	48.6	50.8	49	19	32	37	358	183	67
308	Excelsior	54.4	51.7	49	24	27	47	76	39	18
613	Explosives	46.6	44.3	44	12	44	21	764	429	89
1612	Fancy & misc. articles, n.e.c.	47.8	45.4	41	22	37	38	105	62	23
1613	Feathers, plumes	45.4	43.2	34	27	39	41	29	19	8
114	Feeds, prepared	53.6	52.2	81	3	16	17	537	100	17
220	Felt goods	51.4	48.4	58	17	25	39	842	356	139
614	Fertilizers	56.1	53.3	69	8	23	25	364	114	28
1105	Files	49.0	46.5	22	37	41	47	428	335	159
1106	Firearms	51.9	49.3	19	42	39	52	1046	850	439
1206	Fire extinguishers	49.8	47.3	49	11	40	22	306	156	34
615	Fireworks	51.8	49.2	37	29	34	47	132	82	39
221	Flags, banners	49.7	46.8	46	21	33	38	71	38	15
115	Flavoring, extracts	47.4	46.1	43	5	52	10	201	115	11
222	Flax & hemp	58.3	54.9	47	18	35	34	33	17	6
116	Flour	52.3	50.9	82	3	15	18	264	48	9
117	Food preparations, n.e.c.	50.8	49.5	56	7	37	15	199	88	14
1107	Forgings, iron & steel	51.7	49.1	46	22	32	41	717	388	158

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product: Cost of materials (5)	Wages (6)	Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*): Value of product (9)	Value added (10)	Wages (11)
1305	Foundry & machine shop products	50.5	49.4	37	25	38	40	324	204	81
1614	Foundry supplies	51.2	48.6	53	12	35	26	178	83	21
702	Fuel	51.1	48.5	62	6	32	16	413	156	25
1615	Fur goods	42.2	40.1	63	12	25	33	97	36	12
223	Furnishing goods, men's, n.e.c.	47.8	45.0	55	15	30	34	252	113	38
309	Furniture	51.2	47.9	45	26	29	47	251	138	64
1616	Furs	45.8	43.6	46	21	33	40	162	87	35
1108	Galvanizing & other coatings	53.3	50.6	51	20	29	42	118	57	24
1207	Gas & electric fixtures	48.7	46.2	40	23	37	38	236	142	54
1306	Gas machines	48.3	47.1	37	22	41	35	564	353	124
703	Gas, mfd.	53.2	50.6	37	12	51	19	680	430	80
1008	Glass	49.5	47.0	34	29	37	44	1155	762	334
1009	Glass products, except mirrors	47.7	45.3	49	23	28	46	77	39	18
224	Gloves & mittens, except leather	50.1	47.2	65	20	15	56	239	85	47
905	Gloves & mittens, leather	51.0	46.7	52	24	24	49	152	74	36
616	Glue, gelatin	51.4	48.8	58	13	29	31	439	182	57
1208	Gold leaf	49.6	47.1	49	29	22	55	53	27	15
1209	Gold, silver, & platinum refining, not from ore	46.7	44.4	91	2	7	26	985	93	24
1010	Graphite	54.9	52.2	39	17	44	28	342	209	57
617	Grease, tallow	53.3	50.6	65	13	22	37	207	72	26
225	Haircloth	49.1	46.3	66	14	20	40	297	100	41
1617	Hair work	46.2	43.8	32	26	42	37	29	20	7
226	Handkerchiefs	48.4	45.6	55	16	29	35	281	126	44
1618	Hand stamps	47.7	45.3	25	27	48	36	45	34	12
1109	Hardware, n.e.c.	50.8	48.7	33	30	37	44	473	315	140
227	Hat & cap materials	48.3	45.5	69	11	20	37	223	69	26

228	Hats & caps, men's, n.e.c.	43.8	41.3	47	21	32	41	62	33	13
229	Hats, fur-felt	47.2	44.5	54	22	24	48	642	294	142
1619	Hats, straw, men's	48.0	45.6	46	20	34	37	375	201	74
230	Hats, wool-felt	54.1	51.0	52	26	22	53	647	313	165
1012	Hones, whetstones	49.7	47.2	39	21	40	34	145	88	30
231	Horse blankets	51.5	48.5	51	17	32	35	207	102	36
232	House-furnishing goods	47.5	44.8	60	13	27	32	132	53	17
118	Ice cream	54.4	52.9	47	10	43	19	104	55	11
119	Ice, mfd.	56.8	55.3	19	20	61	25	51	42	10
618	Ink, printing	48.1	45.7	45	9	46	17	291	160	27
619	Ink, writing	47.1	44.7	43	10	47	18	158	90	17
1620	Instruments, professional, scientific	48.0	45.6	32	25	43	37	325	222	82
1110	Iron & steel, blast furnaces	53.7	57.6	79	5	16	26	7347	1535	400
1111	Iron & steel, processed	54.6	51.9	28	23	49	32	84	60	19
1112	Iron & steel, steel works & rolling mills	51.8	47.8	57	21	22	47	6925	3008	1418
1621	Ivory, shell & bone work, n.e.c.	49.3	46.8	41	34	25	57	60	35	20
1210	Jewelry	46.9	44.6	45	22	33	40	115	64	25
1622	Jewelry cases	48.0	45.6	38	28	34	45	78	49	22
233	Jute goods	50.0	47.1	55	20	25	43	1094	495	214
234	Knit goods	51.6	47.2	51	23	26	48	477	235	112
406	Labels, tags	48.6	50.8	38	21	41	34	183	114	38
235	Lace goods	50.3	47.3	35	26	39	40	696	455	183
1623	Lapidary work	45.6	43.3	69	8	23	27	119	37	10
310	Lasts	48.6	46.2	30	33	37	48	133	93	44
906	Leather goods, n.e.c.	47.8	43.8	50	19	31	38	92	46	17
907	Leather	50.6	48.5	70	13	17	44	1022	305	135
1013	Lime	54.8	52.0	39	26	35	43	151	92	40
236	Linen goods	47.8	45.0	54	22	24	48	609	283	137
237	Linoleum	56.0	52.8	48	15	37	29	8179	4252	1223
620	Liquors, vinous	49.7	47.3	25	11	64	15	102	77	12
506	Lithographing	47.4	46.4	32	26	32	39	322	218	85
1406	Locomotives	53.8	51.1	63	21	16	58	5241	1941	1125
704	Lubricating oils, greases, n.e.c.	49.6	47.1	57	5	38	12	393	170	21
311	Lumber	53.8	47.6	33	33	34	49	99	66	33

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product Cost of materials (5)	Percentage of Value of Product Wages (6)	Percentage of Value of Product Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*) Value of product (9)	Per Establishment (*thousands of dollars*) Value added (10)	Per Establishment (*thousands of dollars*) Wages (11)
121	Macaroni	51.4	50.0	58	11	31	27	133	56	15
1318	Machine-tool accessories	52.5	49.5	19	35	46	44	200	163	71
1307	Machine tools	51.4	48.5	26	31	43	42	873	644	273
122	Malt	51.6	50.2	80	4	16	23	843	167	38
1014	Marble, & other stone products	47.6	45.3	30	33	37	47	102	72	36
312	Matches	50.4	47.9	62	20	18	53	969	373	196
238	Mats, matting	47.0	44.3	40	26	34	44	242	144	63
1624	Mattresses, bed springs	49.9	47.4	50	18	32	37	130	65	24
123	Meat packing	48.6	50.4	87	5	8	36	2690	361	130
239	Millinery	46.0	43.3	50	22	28	44	151	75	33
1015	Minerals & earths	54.4	51.7	51	13	36	26	198	96	25
313	Mirror & picture frames	49.5	47.0	34	30	36	45	108	71	32
1016	Mirrors	48.3	45.9	49	23	28	43	105	53	23
1625	Models, patterns	46.8	44.5	17	43	40	52	38	31	16
1626	Motion pictures	47.0	44.7	21	14	65	17	1296	1026	175
1407	Motor vehicle bodies & parts	51.2	48.1	56	24	20	54	1333	590	318
1408	Motor vehicles	48.5	45.5	65	10	25	28	15257	5415	1502
1409	Motorcycles, bicycles	51.0	48.4	47	26	27	50	1138	601	298
621	Mucilage	50.1	47.6	55	8	37	18	79	35	7
1627	Musical instrument parts, pianos and organs	48.8	46.3	36	30	34	47	177	114	54
1628	Musical instruments, n.e.c.	48.8	46.3	27	32	41	44	135	100	43
1629	Musical instruments, organs	50.6	48.1	27	32	41	44	183	133	58
1630	Musical instruments, pianos	49.0	46.6	44	33	23	59	525	292	173
1113	Nails, spikes	49.4	47.0	46	20	34	37	234	125	46
1211	Needles, pins	53.4	50.8	28	30	42	41	512	368	153
240	Nets, seines	50.1	47.2	61	12	27	32	324	125	40
1212	Nonferrous alloys	52.7	50.1	66	13	21	38	743	253	95

622	Oil, cake, meal, cottonseed	58.1	55.2	83	4	13	23	540	89	203
623	Oil, cake, meal, linseed	48.0	45.6	85	3	12	22	4135	633	141
624	Oils, essential	54.1	51.4	57	5	38	11	302	130	15
625	Oils, n.e.c.	50.4	47.9	82	4	14	24	602	110	26
241	Oilcloth	48.9	46.1	65	9	26	26	2567	909	238
124	Oleomargarine	50.6	49.3	66	5	29	14	1135	381	55
1631	Optical goods	48.3	45.9	29	31	40	44	347	245	108
626	Paints, varnishes	51.1	48.6	59	7	34	18	535	221	40
407	Paper	49.3	51.7	59	15	26	36	1412	573	205
408	Paper goods, n.e.c.	49.8	50.4	55	13	32	29	419	189	55
627	Patent or proprietary medicines	47.8	45.4	30	6	64	8	210	147	12
1632	Paving materials	52.5	49.8	46	13	41	24	232	125	30
125	Peanuts, walnuts	53.4	52.0	80	6	14	31	294	60	18
1633	Pencils	49.4	46.9	39	23	38	37	731	448	166
1634	Pens	50.0	47.5	33	16	51	23	450	299	70
628	Perfumes, cosmetics	46.5	44.2	30	7	63	10	237	166	17
705	Petroleum refining	52.6	51.3	77	5	18	22	6768	1560	336
1635	Phonographs	48.9	46.4	39	18	43	30	1642	1009	302
507	Photo-engraving	44.9	44.0	14	41	45	48	118	101	49
1636	Photographic apparatus & materials	47.9	45.5	30	20	50	28	894	630	178
1637	Pipes (tobacco)	46.6	44.2	31	35	34	51	232	159	82
314	Planing mill products	50.0	47.5	53	21	26	45	114	53	24
1213	Plated ware	50.3	47.8	30	27	43	39	577	403	156
1114	Plumbers' supplies	50.9	48.4	38	29	33	46	509	316	145
908	Pocketbooks, purses	46.1	42.2	52	22	26	46	237	115	53
1017	Pottery	50.3	47.8	24	39	37	52	353	267	139
126	Poultry killing	55.3	53.8	82	6	12	31	268	48	15
508	Printing, publishing, book & job	46.0	44.6	26	25	49	34	79	58	20
509	Printing, publishing, music	46.4	45.4	10	9	81	10	123	110	11
510	Printing, publishing, newspaper & periodical	47.2	46.7	23	15	62	19	151	117	22
511	Printing materials	49.2	48.2	25	19	56	26	102	76	20
315	Pulp goods	53.6	50.9	44	17	39	30	605	337	102
410	Pulp	49.3	51.7	62	14	24	36	1207	455	165
1309	Pumps	50.2	49.0	41	21	38	36	509	302	108

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product: Cost of materials (5)	Percentage of Value of Product: Wages (6)	Percentage of Value of Product: Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*): Value of product (9)	Per Establishment (*thousands of dollars*): Value added (10)	Per Establishment (*thousands of dollars*): Wages (11)
629	Rayon	49.9	48.5	22	30	48	38	5157	4007	1541
316	Refrigerators, except mechanical	50.7	48.2	44	22	34	39	322	181	70
1310	Refrigerators, mechanical	50.4	49.2	45	16	39	29	4752	2622	770
242	Regalia	48.8	45.9	41	23	36	39	103	61	24
127	Rice cleaning	56.4	54.9	79	3	18	14	830	173	24
1638	Roofing	52.7	50.1	59	9	32	21	1015	413	88
802	Rubber goods other than tires or shoes	50.1	46.5	47	21	32	39	594	316	122
803	Rubber tires, tubes	47.1	43.7	56	17	27	37	8463	3743	1396
909	Saddlery	49.9	45.7	59	16	25	39	90	37	14
1115	Safes, vaults	50.0	47.5	33	23	44	34	717	480	164
630	Salt	53.5	50.8	37	18	45	28	653	408	116
1018	Sand-lime brick	52.9	50.2	32	26	42	38	74	51	19
1639	Sand paper	50.4	47.9	49	10	41	20	1565	804	158
128	Sausage	50.1	48.7	75	8	17	33	159	39	13
1116	Saws	47.2	44.9	30	25	45	36	279	194	71
1311	Scales, balances	49.8	48.6	24	20	56	26	515	389	102
1117	Screw-machine products	52.7	50.0	37	27	36	44	388	244	106
1312	Sewing machines	48.9	47.8	36	33	31	52	1156	734	384
1410	Ship building	47.1	44.7	37	38	25	61	371	233	141
243	Shirts	47.9	45.2	51	19	30	39	265	129	50
120	Shortenings, cooking oils	52.7	51.3	90	2	8	19	3864	388	75
1640	Signs, adv. novelties	47.2	44.8	30	24	46	34	95	66	23
244	Silk & rayon mfrs.	50.2	48.8	56	19	25	43	490	214	92
1214	Silversmithing	49.8	47.3	33	25	42	38	367	245	92
1215	Smelting, refining, copper	53.9	51.2	93	2	5	32	38261	2863	921
1216	Smelting, refining, lead	53.0	50.3	88	3	9	27	12217	1484	399

1217	Smelting, refining, not from the ore	54.9	52.1	79	5	16	25	999	212	53
1218	Smelting, refining, zinc	54.8	52.1	63	15	22	40	3963	1471	590
631	Soap	49.6	47.2	58	6	36	15	1100	460	67
1641	Soda-water apparatus	49.1	46.7	43	16	41	28	454	260	73
1642	Sporting & athletic goods	50.3	47.8	42	23	35	39	241	140	54
1118	Springs, steel	52.2	49.6	54	20	26	44	543	248	108
1219	Stamped ware	51.4	48.8	43	25	32	43	351	200	86
1643	Stationery goods, n.e.c.	48.9	46.5	43	17	40	30	365	206	61
1019	Statuary	45.2	42.9	20	42	38	53	59	47	25
1644	Steam & other packing	51.6	49.1	48	21	31	41	266	139	56
1119	Steam fittings	48.8	46.3	32	26	42	38	951	648	246
1120	Steel barrels	51.6	49.1	58	15	27	36	714	300	109
512	Stereotyping	45.2	44.3	18	39	43	47	155	126	60
1121	Stoves, ranges	49.4	46.9	37	24	39	38	446	281	107
1122	Structural & ornamental iron work	51.9	49.3	51	18	31	38	322	157	59
129	Sugar, beet	58.2	53.7	65	9	26	27	1324	458	122
130	Sugar, cane	56.6	52.3	67	9	24	27	262	87	23
131	Sugar refining, cane	54.7	50.5	86	4	10	26	24161	3285	850
1645	Surgical appliances	48.3	45.9	50	12	38	25	197	98	25
245	Suspenders, garters	47.0	44.3	59	13	28	32	335	138	44
632	Tanning materials	54.3	51.6	64	8	28	21	316	115	25
1313	Textile machinery	51.0	49.8	30	31	39	44	326	228	101
1646	Theatrical scenery	45.0	42.7	38	18	44	29	100	62	18
1220	Tin & other foils	48.2	45.7	65	9	26	25	2993	1058	265
1123	Tin cans, tin ware, n.e.c.	50.2	47.7	66	13	21	37	1280	439	164
1647	Tobacco, chewing & smoking	50.6	49.3	40	5	55	8	1180	703	59
1125	Tools, n.e.c.	50.4	47.9	32	26	42	38	186	126	48
1648	Toys	50.2	47.7	40	24	36	39	157	94	37
246	Trimmings	46.1	43.4	46	22	32	40	71	38	15
910	Trunks, bags	48.4	44.3	50	22	28	43	137	69	29
317	Turpentine, rosin	46.7	44.4	28	41	31	58	31	22	13
513	Type founding	48.1	47.1	25	21	54	28	137	103	29
1314	Typewriters	50.7	49.5	12	36	52	41	2379	2100	858
1649	Umbrellas, canes	48.9	46.5	61	15	24	39	128	50	20

Industry No. (1)	Industry [1] (2)	Estimated Hours Worked per Week [2] Full time (3)	Estimated Hours Worked per Week [2] Adjusted (4)	Percentage of Value of Product: Cost of materials (5)	Wages (6)	Overhead costs plus profits [3] (7)	Wages as Percentage of Value Added (8)	Per Establishment (*thousands of dollars*): Value of product (9)	Value added (10)	Wages (11)
247	Upholstering materials	52.3	49.3	63	12	25	31	212	79	25
132	Vinegar, cider	53.1	51.7	58	10	32	23	61	26	6
411	Wall paper	51.7	54.0	45	19	36	35	536	295	102
1020	Wall plaster, board	54.2	51.5	40	14	46	24	299	179	43
1315	Washing machines, domestic	49.9	48.7	49	15	36	29	1267	640	186
248	Waste	52.4	49.4	71	9	20	32	265	76	24
1221	Watch, clock materials	48.4	45.9	28	31	41	43	55	40	17
1222	Watch cases	49.5	47.0	34	34	32	52	337	221	116
1223	Watches	47.9	45.5	30	38	32	54	4296	2989	1623
1650	Whips	47.9	45.5	36	21	43	33	28	18	6
1316	Windmills	51.4	50.2	41	25	34	42	576	338	143
318	Window screens	49.8	47.3	43	20	37	36	87	50	18
1651	Window shades	50.0	47.5	54	15	31	33	77	36	12
1126	Wire	54.6	51.9	59	16	25	40	2642	1084	433
1127	Wirework, n.e.c.	51.4	48.8	46	19	35	35	268	144	51
633	Wood distillation	56.5	53.7	50	18	32	36	325	163	58
319	Wood preserving	53.6	50.9	77	8	15	35	960	217	75
320	Wood turned, shaped, n.e.c.	52.0	49.4	41	27	32	45	78	46	21
249	Woolen goods	50.5	48.2	57	23	20	53	632	272	144
250	Wool pulling	50.4	47.5	80	7	13	33	758	152	50
251	Wool scouring	52.8	49.8	48	28	24	55	297	153	84
252	Wool shoddy	52.4	49.4	66	14	20	40	307	104	42
253	Worsted goods	49.4	47.2	63	18	19	49	2031	755	372
1128	Wrought pipe	54.3	51.6	56	15	29	34	2493	1091	375

[1] Abbreviated title; cf. Ap. I for complete titles, arranged by industry numbers.

[2] See Ap. III for method of derivation. Since the figures are approximations, the decimal fractions should be used to indicate the relative and not absolute position of the averages.

[3] Includes all salaries.

Appendix III

Estimates of Average Weekly Hours and Aggregate Man Hours worked in Manufacturing Industries, 1929

Prevailing hours

Estimates of the length of the work week in manufacturing industries are derived from Census compilations of the typical full time hours worked in manufacturing establishments. Census enumerators were given the following instructions with respect to the collection of this information: "The answers to the questions in this inquiry [hours of labor] should represent the normal practice in the plant, and no attempt should be made to account for abnormal conditions or exceptions to the usual practice. For example, in reporting the normal number of hours per week for the individual wage earner, give a figure representing the number of hours for the typical plant operative and disregard the working hours of watchmen, janitors, etc."[1]

Table IIIa, column (2) shows the distribution of wage earners according to the average length of the full time work week, as reported in the *Census of Manufactures: 1929* (I, 60). If a representative value is taken for each grouped frequency, e.g., 42 hours as the average work week for workers in establishments with a work week of more than 40 hours but less than 44 hours, a weighted average can be secured for the total. Such a calculation gives an average of 50 hours as the nominal work week in manufacturing in 1929.[2] The values representing each group are

[1] *Instructions, Census of Manufactures: 1929*, Par. 127, p. 35.

[2] Decline in the length of the prevailing work week in manufacturing industries has been steady. An examination of pre-War and the immediate post-War situations in-

Table IIIa

Variations in Nominal Work Week in Manufacturing Establishments, 1929

Weekly Hours per Establishment (1)	Wage Earners (thousands) (2)	Selected Midpoints (hours per week) All industries (3)	Selected Midpoints (hours per week) Individual industries (4)
Under 40	40	37.0	39.6
40	247	40.0	
Over 40, under 44	84	42.0	43.8
44 and under 45	811	44.0	
45 and under 48	486	45.5	47.6
48	2,352	48.0	
Over 48, under 54	2,200	50.0	50.8
54	555	54.0	
Over 54, under 60	1,321	56.0	58.3
60 and over	655	63.0	

in column (3), their choice being based on sample data compiled by the Bureau of Labor Statistics on the normal work week in

dicates the reduction in hours gained by manufacturing labor prior to 1929, the change between 1914 and 1919 being the most striking. Although statistics are not available for years since 1929, the average of full-time hours undoubtedly has declined along with the marked reduction in the wage earners' actual work week.

Percentage Distribution of Wage Earners in Manufacturing Establishments according to Length of the Nominal Work Week

Prevailing Hours	*1914*	*1919*	*1929*
48 or under	12	49	47
Over 48 but under 54	13	16	25
54 and over but under 60	48	23	21
60 or over	27	12	7
	100	100	100

The increased efficiency of manufacturing operations permitted a rising output of goods in the face of shorter working hours, so that this reduction of labor effort and consequent increase in leisure time has been both a direct and indirect factor in the rise of living standards. With a reduced input of energy and increased opportunities for enjoying the consumer products they help to produce, workers have found their real standard of living increased from two directions.

Calculations similar to that described in the text have been made for each of the 326 manufacturing industries, although in less detail because of the condensed form of the Census reports. The industry averages are reported in Ap. II, col. (3).

selected industries. Because data on hours worked in individual industries are reported in less detail than for all industries combined, a different set of midpoints had to be chosen for the industry calculations. The new midpoints (column 4) are weighted combinations of the old. Industries differ considerably with respect to prevailing hours and it is probable, of course, that variation in nominal hours among establishments is even greater and among individual employees still greater. Unfortunately our statistics relate only to industries. Nominal hours per week, as we have computed them, range from an average of 42 for fur goods to over 58 for three industries—flax and hemp, beet sugar, and cottonseed oil, cake, and meal. Precise determination of the length of the work week in industries at the extreme ranges is difficult because of the open end classes used in reporting the basic data. For example, sample studies of selected establishments have revealed prevailing work weeks exceeding 60 hours in blast furnaces and in cement manufacture, industries which in our tabulations give averages that fall below our maximum value of 58.3.[3] However, these industry averages gain support from the fact that the general average, 50.4, secured from the individual industry figures, is identical with that drawn from the more detailed reports for all industries where the upper limit is reported as 60 hours and over. Such understatement as occurs in the averages for certain industries is offset by overstatement in others.

Fifty-eight industries, employing 1,560 thousand wage earners, had a nominal work week between 49.5 and 50.5 hours (Table IIIb). In 148 industries, employing 4,404 thousand wage earners, the average work week fell between 48.5 and 51.5 hours. This concentration supports the representativeness of the calculated average of 50.4 hours, in which each industry average was given a weight proportional to the number of wage earners employed. These are averages, it must be remembered, not the exact hours in effect. Indeed, the most common standard was 48 hours per week: some 41,000 establishments, employing 2,352 thousand wage earners, operated on a nominal 48-hour work week in 1929 (see Table IIIa). Not all establishments in the

[3] 58.3 hours per week is the maximum that can be shown by our computations because that is taken as the representative value of the upper open end class 'over 54'.

industries represented adhered to this schedule, of course, so that the industry averages are different.

Table IIIb

Nominal Hours of Work, Manufacturing Industries, 1929

Nominal Hours per Week (1)	Number of Industries with Average Hours as Given			Wage Earners in Industries of Col. (2), (3), (4) (*thousands*)		
	Total (2)	Consumption goods (3)	Capital goods (4)	Total (5)	Consumption goods (6)	Capital goods (7)
41.5–42.4	1	1	..	16	16	..
42.5–43.4	..	..	..	..	..	..
43.5–44.4	1	1	..	6	6	..
44.5–45.4	11	10	1	361	360	1
45.5–46.4	9	9	..	218	218	..
46.5–47.4	25	21	4	534	448	86
47.5–48.4	41	34	7	606	563	43
48.5–49.4	48	42½	5½	1,275	1,086	189
49.5–50.4	58	44	14	1,560	1,100	460
50.5–51.4	42	27	15	1,569	858	711
51.5–52.4	26	17	9	990	425	565
52.5–53.4	21	16	5	487	366	121
53.5–54.4	19	13½	5½	566	281	285
54.5–55.4	11	6	5	521	481	39
55.5–56.4	5	5	..	33	33	..
56.5–57.4	5	4	1	74	41	33
57.5–58.4	3	3	..	23	23	..
Total	326	254	72	8,839	6,306	2,532
Arithmetic mean	50.2	50.0	50.9	50.4	50.1	51.3

In general, the length of the work week tends to vary with the size of the establishment. Table IIIc shows the distribution of the number of wage earners in plants of different size according to reported nominal weekly hours. Thus approximately 20 per cent of all establishments with fewer than 50 wage earners (regardless of industry) were normally operated 48 hours per week. This proportion is considerably higher in the larger plants, increasing to over 35 per cent of all employees in plants having more than 1,000 wage earners. For work weeks varying in length from 48 to 54 hours approximately the same frequency in the larger as in smaller plants is observed, but this is not true for hours greater than 54. Of the 2,160 thousand workers in the

very large plants (over 1,000 per establishment) only 18.0 per cent were reported by establishments with a nominal work week of over 54 hours, as against 26.6 per cent in plants with 101 to 500 wage earners, and a work week of 60 hours or more is much more common in small than large establishments. At the same

Table IIIc

Percentage Distribution of Manufacturing Wage Earners according to Nominal Hours of Plant Operation and Size of Establishment, 1929

	Percentage Distribution of Wage Earners According to Nominal Hours per Week in Establishments with Wage Earners Numbering				
	1–50	51–100	101–500	501–1,000	Over 1,000
Hours not reported	5.2	..	..	..	..
Under 40	1.1	.7	.3	.3	.1
40	4.7	2.2	1.6	2.7	3.1
Over 40, under 44	.8	.7	1.7	.5	.5
44 but under 45	19.3	12.6	6.6	5.8	5.2
45 but under 48	6.4	6.7	5.2	4.1	5.5
48	19.5	21.6	24.2	29.5	36.0
Over 48, under 54	18.0	25.6	27.1	25.6	26.6
54	6.8	7.5	6.7	5.9	5.0
Over 54, under 60	7.9	13.6	17.7	19.4	14.8
60 and over	10.3	8.8	8.9	6.2	3.2
Average full time hours per week	49.5	50.4	51.0	50.7	49.9
Thousands of wage earners	1,690	892	2,920	1,177	2,160

Source: Based on data in Table 8, *Census of Manufactures, 1929*, I, 60

time, 44 hours constituted a work week for 20 per cent of wage earners in the smallest plants as against only 5 per cent of those in the largest plants. The tendency is for the smaller plants to operate at the high and at the low rates. If we calculate averages in the manner described above, no outstanding differences appear, since the extremes of the smaller establishments tend to

counterbalance. Employees in plants with 101 to 500 wage earners worked an average full time week of 51 hours; the largest plants with over 1,000 employees per plant averaged a full time week of 49.9 hours. These figures are affected, of course, by industrial differences but to what extent it is impossible to say since industry figures by size of establishment are not available. In Appendix II the average hours worked in individual industries, as well as data on the average size of the plants, by industries, are presented.[4]

Estimated actual hours

While average hours prevailing in manufacturing industries form an integral part of the manufacturing structure, it is the hours actually worked that measure labor effort. The capacity of the labor force may be in terms of full time hours but this is often a theoretical capacity, for the work week is subject to modification (other than for changing demand) for reasons of breakdown of physical equipment, illness or accident to the wage earner, lack of materials or supplies, seasonal influences, or any of the various factors that may disrupt the normal schedules of the manufacturing plant. An approximation to the labor cost of goods turned out by the manufacturing process necessitates an estimate of the actual hours worked (Table IIId).

In most instances actual hours were estimated from full time hours by using ratios between actual and full time hours in selected industries for which both sets of data were available. Actual man hours worked in four industries—blast furnaces, machine tools, lumber, and petroleum refining—were compiled in the 1929 Census of Manufactures and the estimates of hours in these industries have been based on these data. For 10 industries —baking, cigarettes, sugar refining, men's clothing, dyeing and finishing of textiles, cement, iron and steel, aluminum, brass and copper manufactures, aircraft—the ratio of actual to full time hours was computed from Bureau of Labor Statistics reports relating to some period during 1929 or an adjacent year. For 21 additional industries included in National Industrial Conference Board surveys, average hours worked in 1929 were related to

[4] But note that the hours figure is a weighted average, since it is based on frequency distributions of wage earners by prevailing hours per establishment.

full time hours in 1928 (data unpublished) and these ratios used to adjust the full time hours based on the Census tabulations. (Data on full time hours in 1929 were not available for the individual industries, but comparison of the Conference

Table IIId

Estimated Actual Hours worked in Manufacturing Industries, 1929

Hours per Week	Number of Industries with Estimated Hours as Given			Wage Earners in Industries of Col. (2), (3), (4) (*thousands*)		
	Total	Consumption goods	Capital goods	Total	Consumption goods	Capital goods
(1)	(2)	(3)	(4)	(5)	(6)	(7)
39.5–40.4	1	1	..	16	16	..
40.5–41.4	1	1	..	6	6	..
41.5–42.4	5	5	..	349	349	..
42.5–43.4	8	7	1	82	81	1
43.5–44.4	19	19	..	427	427	..
44.5–45.4	28	23	5	649	560	89
45.5–46.4	41	35	6	525	493	32
46.5–47.4	46	35	11	847	791	56
47.5–48.4	43	33	10	2,429	1,207	1,222
48.5–49.4	42	28	14	1,563	912	651
49.5–50.4	29	17	12	543	267	276
50.5–51.4	23	18	5	417	320	97
51.5–52.4	19	13	6	702	651	51
52.5–53.4	7	7	..	65	65	..
53.5–54.4	6	6	..	47	47	..
54.5–55.4	6	6	..	114	114	..
55.5–56.4	..	..	..	..	..	..
56.5–57.4	1	..	1	33	..	33
57.5–58.4	1	..	1	25	..	25
Arithmetic mean*	48.0	47.8	48.7	48.0	47.8	48.7

* These averages are shown here to one decimal point in order to indicate differences arising from the application of a particular method of estimate, with certain broad assumptions, upon the basic data. The possibility of error prohibits the isolation of individual figures or averages for special emphasis apart from the other figures of the table.

Board's general averages indicates no change in average full time hours from 1928 to 1929.) The industries for which these ratios were obtained are: meat packing, cotton goods (weighted average, North and South) knit goods, silk and rayon, woolen and worsted goods, furniture, lumber and mill work, paper and

pulp, paper products, book and job printing, newspaper and periodical printing, chemicals, paints and varnish, rubber products, leather, boots and shoes, hardware, agricultural implements, electrical apparatus, foundry and machine shops, motor vehicles. The total sample represented some 60 per cent of all manufacturing, though the representation of each industry is, of course, incomplete. It should be noted also that the data drawn from Bureau of Labor Statistics reports cover but part of the year, and in some instances, a year other than 1929.

To adjust the full time hours of industries not covered in the preceding lists, group averages were used for industries falling into the following Census groups: food and kindred products, textiles and their products, paper and allied products, printing and publishing and allied products, rubber products, leather and its manufactures, machinery not including transportation equipment. For all other industries for which the needed ratios were not available, the general average drawn from all samples was used to adjust the full time hours figures. The adjustment ratios varied from 1.04 for paper and paper products to .92 for leather and leather products. The average ratio of actual to full time hours, for the entire sample, was .95.

The prevalence of 50 hours as the average nominal work week in manufacturing in 1929 has already been pointed out. No such marked central tendency is to be found in the hours actually worked. This is to be expected, for to variations in customary factory operation are added variations among industries arising from diverse conditions of business health, different policies toward maintenance of labor supply, and different conditions of productive stability. The factors bringing about these variations cannot be isolated, and indeed, in many instances we have no specific measure of the relation of actual to full time working hours. But if our estimates of actual hours are accepted they do reveal a considerable degree of uniformity. Few industries had a work week of over 53 hours, few below 43. Over half the industries had a work week ranging from 45.5 to 49.5 hours. The most common range was from 46.5 to 47.5 but the simple mean of the distribution is slightly higher, 48.0. This is also the average weighted by the number of wage earners in each industry. The 48-hour week was an actuality, though

there were many industries in which the average work week was longer, many in which it was shorter.

In the preceding section no wide difference in prevailing hours between industries producing consumption and capital goods was found. Much the same conclusion is reached for estimated actual hours between the same groups of industries. A somewhat more precise division, wherein an industry with joint products is appropriately represented in several groups, provides the comparison in Table IIIe.

Table IIIe

Estimated Hours per Week worked in the Manufacture of Consumption and Capital Goods, 1929

Ultimate Product	Estimated Average Hours per Week
Consumption goods, total	47.4
Foods	49.5
Wearing apparel, etc.	46.3
Household goods	48.1
Private transportation	47.4
Publications	46.8
Other	47.8
Capital goods	48.4
Construction goods	48.3
Producers' supplies	49.4
Total	48.0

Aggregate man hours

The length of the work week is one factor measuring labor effort; the number of workers engaged is another. The product of these two gives man hours, which is our best measure of labor effort in manufacturing. The number of wage earners as reported by the Census is an average for the 12 months of the year, so that seasonal fluctuations in number employed are compensated. But to translate weekly man hours into annual aggregates, the product of weekly hours and number of wage earners must be multiplied by 52. Aggregate man hours worked

by wage earners in manufacturing in 1929 as thus estimated are 22,037 million. The method of estimate applied to number of salaried workers places their annual aggregate man hours at 3,390 million. Together, the estimates indicate some 25 billion [5] hours spent in manufacturing in 1929. The apportionment of this aggregate, according to type of good produced, is discussed in Chapter II.

[5] Because of holidays and vacations with pay, 51 weeks per year or fewer might more properly be used in the calculation of hours actually worked per year. If the smaller multiplier is used, the man hour total becomes slightly less than 25,000 million.

An interesting check on the general accuracy of our aggregate man hours is a composite hourly rate of wages obtained by dividing the 22,037 million man hours worked by wage earners into the $11,621 million received as wages. The quotient, 53 cents, compares favorably with the estimate of 59 cents reported as the average hourly earnings for the sample industries of the National Industrial Conference Board. Examination of the industrial composition of this sample, and comparison of recent figures with the more extensive compilations of the Bureau of Labor Statistics now available, indicate that the absolute level of the Conference Board average is high. The 1929 average of 53 cents does not, therefore, seem greatly in error. The average salary rate is $1.06 per hour, on the assumption that in each industry salaried employees worked the same number of hours per week as did wage earners. If principal salaried officers of corporations as classified separately by the Census are excluded from the computations, the rate is reduced to 88 cents per hour.

Appendix IV

Net Value of Manufactured Product

The divisions of value added by manufacture according to use of the ultimate product presented in Chapter II measure the productive contribution made by manufacturing industries in the manufacturing process. If these data are combined with other available estimates relating to the contributions of primary producers, measures may be obtained for the net values of manufactured goods (at factory prices) produced in 1929. This is made possible by analysis of data presented in a special Bureau of the Census monograph, published as a part of the 1929 Census of Manufactures.[1] The methods of estimation are rough, but the results are as good as can be obtained under the circumstances and sufficiently accurate to indicate general magnitudes. In Table IVb these estimates of net value of product are contrasted, according to broad groupings, with Dr. Kuznets' estimates of the value of finished products[2] and no wide discrepancies appear. The results provide not only general indications of the output of products that flow through manufacturing industries but also supply information on the part played by primary producers in the creation of different types of economic goods.

Something must be said about the method of securing the estimates in Table IVa. The net value of manufactured products is the value added in the manufacturing process plus the value contributed by producing agents before the commodities reach the manufacturing stage.[3] In other words, to the value added

[1] *Materials Used in Manufactures: 1929*, Tracy E. Thompson (Washington, 1933).
[2] *Commodity Flow and Capital Formation*, Vol. I (National Bureau of Economic Research, 1938). Dr. Kuznets' figures for value of finished goods at the manufacturing stage for major groups were given in Table 1, Ch. II.
[3] The figure is 'net' only in that duplications in the sales of the same commodities are excluded. The cost of durable producers' goods consumed in the productive process is not deducted.

by manufactures must be added the value of raw materials, unmanufactured fuels, and imported semimanufactured goods entering the domestic manufacturing system. The largest of these supplemental items is, of course, the value of raw materials, including the products of farms, mines, and forests. Avoiding duplication of items already covered in the manufactures figure, the value for 1929 is $12,676 million. Semimanufactures imported for further fabrication total $1,855 million and the value of unmanufactured fuels used in manufactures is $1,298 million. These are the figures published in the Bureau of the Census report mentioned. The separation of raw materials according to ultimate product is based on figures presented in Chapter II, Tables 2 and 3. Unfortunately these data are based on all materials, in both raw and semimanufactured form. The influence of semimanufactured materials can be minimized by apportioning separately the three items, raw materials, imported semimanufactures, and manufactured fuels, for in apportioning raw materials a special group of 68 industries into which go the bulk of the raw materials can be separated for special study. The value of raw materials used by these industries, which were divided according to the eleven Census groups in which they occur, was allocated according to the use of the final manufactured product by applying the appropriate ratios of distribution of all materials, both raw and semifinished. For example, for those of the 68 industries which may be included in the food processing group (Census Group I), ratios showing the ultimate use of all materials consumed were derived from an analysis of the individual industries and these ratios used to allocate the five and one-half billion dollars of raw materials consumed. The value of the rest of the raw materials going into the food group, about $155 million, was apportioned in the same fashion, using the data for the other industries of the group. This procedure was followed for each Census group, although in many of them the percentage of semimanufactured materials consumed is higher and the accuracy of our computations correspondingly lower. To a considerable extent the error introduced by this method of estimation is reduced by use of the fairly homogeneous Census groups; moreover, there is no reason to believe that errors are consistently in one direction. Some degree of off-

setting must be present in the fairly large groups for which the figures are presented. These considerations apply equally to the division of imported semimanufactures and unmanufactured fuels which have been similarly allocated.

The estimated values of the contributions prior to the manufacturing stage are presented in Table IVa, together with the values contributed by manufactures.

Table IVa

Net Value of Manufactured Products, 1929

Ultimate Use of Product	Value Added by Domestic Manufacture [1]	Value Contributed by Antecedent Producers	Total Net Value of Product	Percentage of Net Value Contributed by Manufacture
		(*millions of dollars*)		
Consumption goods	17,871	11,309	29,180	61.2
Capital goods	7,055	1,155	8,210	85.9
Construction materials	3,379	1,042	4,421	76.4
Producers' supplies	3,109	2,323	5,432	57.2
All manufactures [2]	31,414	15,829	47,243	66.5
Consumption goods				
Foods	4,119	6,383	10,502	39.2
Wearing apparel, etc.	4,926	2,306	7,232	68.1
Household goods	2,824	741	3,565	79.2
Transportation	3,171	1,283	4,454	71.2
Domestic fuel and light	326	302	628	51.9
Drugs, medicines, and supplies	322	50	372	86.6
Publications	1,802	220	2,022	89.1
Recreation goods	381	24	405	94.1

[1] Differs slightly from the figure for total value added given in the text and in the 1929 Census because of the exclusion of payments received for contract work. Transportation costs arising from the inter-industry movement of semifinished goods (estimated in Table IVb at $300 million) are not included.

[2] As published in *Materials Used in Manufactures: 1929.*

A net value of manufactured goods of $47,243 million is the estimate reported by the Census of Manufactures (*Materials Used in Manufactures: 1929*, p. 1). Of this amount the present analysis indicates that $10.5 billion, or over 20 per cent, is food-

stuffs; some $7 billion (15 per cent) wearing apparel and personal goods; about $4.5 billion the value (at the producers' stage) of passenger cars and the supplies essential to their operation for general consumer use; some $3.5 billion the value of the aggregate of goods for house-furnishings and maintenance. These are the big items among consumption goods, the group that constitutes over 60 per cent of the total value (at producers' prices) of all goods manufactured in 1929.

The net value of capital goods is some $8 billion; although to this should be added a considerable portion of the value of the construction materials that appear at the manufactures stage. If the $4,421 million of construction materials is divided between consumers' goods and capital goods in the proportions of one-third and two-thirds, then capital value, at the manufacturing stage is some $11 billion.[4]

The item producers' supplies contains materials that are used both by manufacturers and by productive agents at earlier and later stages. It includes, for example, the value of containers, roughly $900 million, which are used chiefly by other manufacturers and should be included in the totals given above. A large part of this item should be allocated to the foods group, but the rest goes to both other manufacturers and nonmanufacturers. Ultimately, producers' supplies are probably used in processes serving consumers and might therefore be classed with the major group consumers' goods but, because some of these fuels, chemicals, and general office and shop supplies are also used in the making of what we have classified as capital goods, the entire group cannot be thus allocated. It is difficult, of course, to divide these items in accordance with our scheme of classification, but a rough division of the part consumed in manufacturing industries (estimated at 40 per cent of the total) would be approximately 90 per cent for consumption goods and 10 per cent for capital goods. Of the 60 per cent not consumed in manufacturing industries almost all goes for ultimate consumption purposes.

There is considerable variation among groups in the propor-

[4] For an analysis of the value of finished goods, at the consumer stage, of the various types recognized in the present analysis, see *Commodity Flow and Capital Formation*, Vol. I, by Simon Kuznets. The present figures and those of Dr. Kuznets are compared in Table IVb.

tion that value added by manufacture is of the total net value at the factory stage, and, of all the groups of products, foods receive least in the fabricating processes. Coming to the manufacturing industries in unprocessed form, with an estimated value of over $6 billion,[5] they receive an additional $4 billion in value before passing into the hands of distributors or consumers. This is slightly less than 40 per cent of the total factory value of foods and compares with 61 per cent for all consumption goods and much higher figures for certain of the groups. Over 85 per cent of the estimated net value of capital goods had its origin in manufacturing industries; over 75 per cent of the value of construction materials is added in manufactures. This rather surprisingly high figure for construction materials results in part from the inclusion in manufacturing of the products of sawmills, cement plants, and similar establishments of a quasi-extractive character, and the exclusion of certain building materials that require little or no processing, such as sand and gravel. The highest ratio for all groups is that for recreation goods, a small group and one for which there may be some question of the adequacy of the estimate. The inclusion of the motion picture industry, with its low cost of raw materials, is a sufficient explanation of this striking ratio.

In examining Table IVa it should be kept in mind that the values are in terms of the prices received by manufacturers and relate to the stream of goods that has just passed the point of manufacturing. But the flow could have been measured at a later point, and for some purposes it is desirable to do so. Costs of getting goods to final consumers vary with the type of product, and the margins between factory values and costs to consumers are certainly not constant. For this reason the figures of Table IVa cannot be compared with estimates of national income, or with the buying power of different groups of consumers, or, as they stand, with estimates of national income originating in manufacturing industries. For purposes of measuring the nation's income, the value of the services rendered manufacturers by outside agencies is distinguished from the

[5] It has been estimated that the value of nonmanufactured foods sold directly to consumers (fruits, vegetables, dairy and poultry products, fresh fish) in 1929 was, at producers' prices, $2,867 million (Simon Kuznets, *op. cit.*, p. 136).

services of the manufacturers themselves. For example, payments made to banks for the use of capital is, from the point of view of national income, payment for a service originating in the finance group and not to be considered a part of the contribution of manufacturing or to be included in the total 'value added by manufacture'.

Payments for professional services such as those rendered manufacturers by independent architects, accountants, lawyers, or other professionals are for some purposes to be distinguished from the contribution of the manufacturing enterprise. Again, payments to government employees, in part traceable to the taxes paid by manufacturing concerns, are considered as national income originating in these public services. So far as these various payments are covered in the value of the goods sold by manufacturing plants, and therefore reported in the item 'value added by manufacture' they have been included in the totals of Table IVa; they are associated with the manufacturing process by reason of the productive stage at which the service is rendered.

Not the origin, in which we are here chiefly interested, but the final destination of manufactured goods may be the focus of attention, and this has been the approach followed by Simon Kuznets in his study of capital formation. His survey is restricted to finished manufactured goods, expanded to cover the distributive activities following that of manufacturing, and results in the estimates of the values of finished goods at producers' prices cited earlier. These estimates of the value of finished goods at the manufacturers' stage should approximate those in Table IVa but cannot be identical, for they differ in timing as well as in scope and methods of classification. Nevertheless, comparison, by groups, of the value of 'finished' manufactured products and the above estimates of the 'net' value of manufactured product is of interest (Table IVb). An attempt is made to reconcile the various classification differences.

Dr. Kuznets' estimate of the value of finished manufactured goods, at producers' prices, for 1929 is $41.5 billion; the net value figure in Table IVa is $47.2 billion. The difference in these totals is due largely to the manner of defining the limits of the tabulation and has been discussed in some detail by Dr.

Kuznets.[6] The comparison of the estimates by detailed groups in Table IVb suggests the source of much of this difference. The closeness of the figures, after adjustment for lack of comparability, confirms to some degree the reasonableness of the estimates, particularly the present ones, for they have been prepared in a more devious fashion. Both estimates are based on Census of Manufactures data, but the material and the methods are so different that their common origin does not lessen the legitimacy of the comparison.

[6] *Op. cit.*, pp. 19–26

Table IVb

Two Estimates of the Value of Manufactured Products, 1929 [1]

Group (1)	Estimates of Net Value (2)	Estimates based on Finished Products (3)	Difference Col. (2)–(3) (4)	Adjustment for Comparability (5)	Net Difference (6)
		(millions of dollars)			
Consumption goods, total	29,180	28,582			
Foods	10,502	11,021	−519	+466	−53
Wearing apparel, etc.	7,232	7,020	+212	−260	+159
House-furnishings	3,008	2,801	+207		
Household supplies	557	1,112	−183	+30	−153
Drugs, etc.	372				
Recreation	405	406	−1	−184	−185
Publications	2,022	1,179	+843	−1,120	−277
Fuel and light	628	1,318	+306	−393	−87
Automotive fuel	996				
Transportation	3,458	3,725	−267		−267
Capital goods	8,210	7,885	+325		+325
Construction materials	4,421	5,075	−654		−654
Producers' supplies	5,432	..	+5,432	−4,022	+1,410
Fuel, mfd.	2,686	..			
Containers	930	..			
Other	1,816	..			
Grand total	47,243	41,542			
Exported semimanufactured goods [2]					−902
Estimated freight costs, semimanufactured goods [3]					+300
Total net difference after adjustment for comparability					−384

[1] Coverage of the two estimates is not the same, and certain undistributed items of our estimates must be considered. The entries of col. (2) appear in Table IVa. The entries

in col. (3) are the following combinations of minor groups given in Table I–4 of *Commodity Flow and Capital Formation*, Vol. I, by Simon Kuznets. Foods: groups 1, 2; Wearing apparel, etc: groups 6–11, 23, 25, 30, consumers' goods servicing; House furnishings: groups 12, 15–21; Household supplies and drugs, etc.: group 3; Recreation goods: groups 13, 22; Publications: groups 4, 24; Fuel and light, including automotive fuel: group 5; Transportation: groups 14, 26–29; Capital goods: groups 32–44 and producers' goods servicing; Construction materials: group 31 and special group of same name (p. 99).

The entries in col. (5), making for greater comparability of the estimates, are explained as follows:

Foods: $596 million (+) estimated as value of containers used for foods, classified under producers' supplies in col. (2); $130 million (—) for poultry packing excluded under col. (3).

Wearing apparel, etc., house-furnishings: another $260 million (—) reported as receipts for contract work in textile industries included in col. (2) but excluded from col. (3). $302 million paid by manufacturers for contract work is not included in the entries of col. (2). A portion of this sum represents work done for nonmanufacturers, and is therefore not a duplicating item from the viewpoint of the present study. Examination of the 1925 Census of Manufactures (the latest complete report on amounts paid by manufacturers for contract work) indicates that the $302 million paid for contract work used in the estimate is an understatement by about $50 million. The net value estimate of the Bureau of the Census, however, has not been changed.

Drugs: $30 million (+) of containers traceable to drug industry classified under producers' supplies in col. (2).

Recreation: $184 million (—) motion picture industry excluded from col. (3).

Publications: $1,120 million (—) receipts for advertising are included under col. (2), but excluded under col. (3).

Fuel and light: $393 million (—) manufactured gas, excluded under col. (3).

Producers' supplies: $596 million (—) from containers transferred to the food group, $30 million (—) to the drug group, $161 million (—) used outside manufacturing, $1,843 million (—) from producers' fuels estimated as consumed outside the manufacturing industries, $1,286 million (—) other producers' supplies consumed outside manufacturing industries, $106 million of gas used for industrial purposes, not included under col. (3).

[2] Manufactured goods exported before reaching the final manufacturing process are not included in Dr. Kuznets' totals used in this table. The Department of Commerce reports total exports in 1929 of wholly and partly manufactured goods to be $3,745 million; Dr. Kuznets estimates exports of goods considered finished at $2,720 million. The difference, $1,025 million, is the value of partly manufactured goods exported before completion. This figure is reduced 12 per cent to approximate the lower valuation at the manufacturers' stage (cf. Kuznets, *op. cit.*, p. 123).

[3] The estimates of net value in col. (2) are understatements by reason of the omission of freight and other charges incurred in the movement of semimanufactured goods between manufacturing industries. The values of semimanufactured goods if reported by manufacturers would be less for this reason than the amounts that would be reported for the cost of these same products by the manufacturers next in line. (See the discussion, Defects in the Method of Finding Net Value of Products, 12th Census of the United States, Vol. 7, p. cxli.) The estimate of $300 million is based on an analysis of freight revenues of Class I railroads for the shipment of semifinished manufactured goods. No allowance for middlemen's profits has been made.

Appendix V

Exports and Imports of Manufactured Goods, classified according to Ultimate Use of Product

A nation ordinarily increases its capital supply in two ways: by diverting part of its productive energies from the making of consumption goods to the making of products that may be utilized as productive capital, or by continuing to make consumption goods and purchasing with them capital goods produced in other countries. The figures in Chapter II on the relative output of capital and consumption goods are qualified,

Table Va

Exports and Imports of Manufactured Goods classified according to Ultimate Use, 1929 [1]

Ultimate Use	Exports		Imports [2]		Net Exports (*millions of dollars*)
	Millions of dollars	Per cent	Millions of dollars	Per cent	
Consumption goods	1,944	51.5	1,609	66.1	+335
Capital goods	1,087	28.8	194	8.0	+893
Construction materials	244	6.4	111	4.5	+133
Producers' supplies	501	13.3	520	21.4	−19
Total	3,776	100.0	2,434	100.0	+1,342

[1] Includes semimanufactured goods, as classified by the Census of Manufactures. The totals differ somewhat from Department of Commerce estimates.
[2] Import duties of $585 million have been ignored.

for some purposes, by the fact that some quantity of almost every product was used in other countries. Consequently, it is desirable to examine the exports and imports of manufactured goods in a manner similar to that employed in the analysis of the domestic productive system. A classification of the values

of goods leaving and entering the country in 1929, according to their ultimate uses, is indicated in Table Va[1].

Of $3,776 million of manufactured and semimanufactured goods exported in 1929, we estimate that $1,944 million, or 51.5 per cent, were destined for human consumption, and $1,087 million (28.8 per cent) were capital goods. The two minor groups, construction materials and producers' supplies, contributed 6.4 and 13.3 per cent to the total. The significant fact is that whereas capital goods constituted only 19.8 per cent of production in 1929 they were 28.8 per cent of exports. On the other hand, imports of capital goods or goods ultimately to be utilized for capital purposes were small—only 8 per cent of imports of all manufactured and semimanufactured products. In terms of net movements, the capital goods group is outstanding; approximately two-thirds of the value of net exports in manufactured goods were for capital use. This comparison of net movements is affected slightly by a reverse flow in the case of producers' supplies, with a net import figure of $19 million, but because of the nature of the classification, the magnitude of this differential is probably not significant.

Among consumption goods, foodstuffs constituted 24.4 per cent of exports of manufactured goods and 39.6 per cent of imports, involving transactions of over a billion dollars (see Table Vb). Most striking, however, are the exceptionally heavy exports of goods used for private transportation, chiefly passenger automobiles and petroleum products, amounting to $773 million or 40 per cent of all exports[2] of consumption goods.

[1] It is assumed that the value of products with joint uses (uses falling into different groups of our classification scheme) may be allocated in accordance with the same ratios that have been used for domestic production. This, in many instances, is quite legitimate since the ratios are based on data for total consumption of both domestic and foreign production. Where the ratios were calculated on the basis of the domestic use of domestic production alone, the assumption is probably still valid, though the assumption that goods exported will be put to the same uses abroad, and in the same proportions, as though they were consumed at home is less tenable. From the viewpoint of net changes in our domestic stock, however, the same ratios must be applied throughout.

Since foreign trade data are for the calendar year 1929, they are not quite comparable with production data, because of the time lag in exports. However, as shipments are from stock in many instances, the identity of the goods is not essential for our comparison.

[2] Total exports in 1929 of the two groups, petroleum refining and automobiles, were $1,113 million. A portion of the first group has been included among producers' supplies, and some of the second group, which includes trucks, was apportioned to capital

But imports of these goods are small, less than 6 per cent of the imports of all goods ultimately to be used for consumption purposes.

Division of the consumption goods total into subgroups reveals markedly different relationships between exports and imports than might be expected from the totals. The net export movement of $335 million of goods destined for human consumption results from the heavy export of automobiles and a small credit item from the miscellaneous group of drugs, goods for recreation, and manufactured fuels for domestic use. Imports of foods and of wearing apparel and goods for personal use exceeded exports of similar products by $163 and $218 million.

Table Vb

Exports and Imports of Manufactured and Semimanufactured Goods destined for Human Consumption, 1929

Ultimate Consumer Use	Exports		Imports		Net Exports (*millions of dollars*)
	Millions of dollars	Per cent	Millions of dollars	Per cent	
Foods	475	24.4	638	39.6	−163
Wearing apparel, etc.	247	12.7	465	28.9	−218
Household goods	272	14.0	293	18.2	−21
Transportation	773	39.8	88	5.5	+685
Publications	68	3.5	90	5.6	−22
Other [1]	109	5.6	35	2.2	+74
Total	1,944	100.0	1,609	100.0	+335

[1] Includes domestic fuel and lighting (manufactured only, excluding electricity), drugs, medicines and supplies, recreation goods.

If a direct relationship between merchandise exports and imports may be assumed, it is fair to consider that net purchases of foods and clothing were made with motor cars. It might as readily be said, of course, that they were bought with industrial machinery or with raw cotton, since there is no mutually exclusive trade within special commodity groups.

The significance of these trade movements from our point

goods. Where a division of a commodity according to *use* could not readily be accomplished on the basis of its description or its subgroups, reference was made to the industry divisions of Ap. I.

of view depends upon their magnitude relative to the volume of manufacturing production. Accordingly in Table Vc they are set against estimates previously prepared for domestic output. The importance of foreign trade movements is probably overstated in this comparison, for many manufactured goods are shipped for export by wholesalers or similar distributive agencies with the result that their selling prices are higher than values at the factory door as reported in the Census.[3] Because of the uncertainty of the degree of overstatement, and lack of information on the industries where it occurs, neither export figures nor data on imports have been adjusted for such differences. It is assumed that all valuations are on approximately the same basis.[4]

The net movement of foreign trade relative to production is not appreciable except for two groups: commodities related to private transportation and capital goods in which net exports amount respectively to 8.2 and 6.4 per cent of domestic production. In the other groups the net movement ranges between + 4.3 and — 1.9 per cent, despite the overstatement in the

[3] That the value of exports of manufactured goods includes a distributive margin not included in the Census totals is the conclusion of Simon Kuznets in his study of commodity flow and capital formation. His average reduction factor is 12 per cent. The average export price of manufactured goods is usually, though not always, above the average factory price. Ten commodities, for which average prices could be computed and for which there was a maximum of probable comparability between export and production data as to quality, averaged around 10 per cent higher in price when per unit export values were compared with Census value of product per unit. The commodities selected for examination were not highly fabricated, however, lest variation in quality influence the comparisons. It is improbable therefore that instances of price cutting and 'dumping' in foreign markets are represented, since this practise is followed more frequently in the distribution of fully manufactured products. The ten commodities examined are (in order of excess of export price): evaporated milk, newsprint paper, turpentine, gasoline, cottonseed oil, cotton sheetings less than 40 inches wide, tin plate and terne plate, wheat flour, barbed wire, refined sugar.

Doubt as to the validity of the assumption that export values are significantly higher than manufacturers' values is raised by a comparison of sales in 1935 of wholesalers for export and the total export values reported for the same year by the Bureau of Foreign and Domestic Commerce. When the sales of unmanufactured farm products and other unmanufactured commodities are excluded, wholesalers' foreign sales in 1935 amount to $596 million. Total exports of manufactured and semimanufactured goods, however, were $1,501 million, so that the wholesalers reporting to the Bureau of the Census account for but 40 per cent of the total. If sales by manufacturers' sales branches are excluded from sales by wholesalers, the percentage falls to 33. The explanation of the other 60–67 per cent must be direct foreign sales by manufacturers, and for this portion no adjustment for wholesalers' commissions would be warranted.

[4] Ocean freights and import duties would modify the values of imports if they were taken into account. The effect of both modifications would be to reduce, in terms of domestic prices, the magnitude of the net exports.

trade figures pointed out above, and except for the minor group of miscellaneous consumption goods does not exceed 2 per cent of domestic production.

The product totals of Table Vc contain duplications arising from the inclusion of semimanufactured goods. This is less troublesome in the foreign trade figures where duplications cannot occur, since the value of a semimanufactured good sent from the country cannot appear also in the value of a finished commodity of domestic manufacture. But in relation to the productive system at large, duplications occur by reason of the presence of unfinished products. To the extent that they occur to approximately the same degree in the trade totals as in the total of manufactures, the two sets of figures are comparable. Rough estimates based on the records of foreign trade, and comparison with our divisions of domestic product, show the proportion of finished goods to be reasonably the same. A higher percentage of final products occurs in exports than in imports, as would be expected of an industrial country like the United States.

Table Vc

Relation of Net Exports of Manufactured Goods to the Value of Manufactured Products, 1929

Ultimate Use	Value of Products (gross sales)	Net Exports	Production less Net Exports	Adjusted Estimate as a Percentage of Unadjusted
	(millions of dollars)			
Consumption goods, total	42,504	+335	42,169	99.2
Foods	12,898	−163	13,061	101.3
Wearing apparel, etc.	11,395	−218	11,613	101.9
Household goods	5,417	−21	5,438	100.4
Private transportation	8,312	+685	7,627	91.8
Publications	2,752	−22	2,774	100.8
Other	1,730	+74	1,656	95.7
Capital goods	13,920	+893	13,027	93.6
Construction materials	6,784	+133	6,651	98.0
Producers' supplies	7,227	−19	7,246	100.3
Total	70,435	+1,342	69,093	98.1

The adjustment of value totals for net exports can be carried over to other elements of manufacturing activity by use of the

ratios appearing in the last column of Table Vc on the assumption that the same proportion of exports applies throughout a given type of manufactured product; e.g., that 8.2 per cent of the value added in making automobiles and in refining petroleum for consumers' use is embodied in the 8.2 per cent of the value product that is sent abroad. The assumption is perhaps crude but the adjustments are not large. Table Vd shows the revised figures for certain of the items discussed earlier.

Table Vd

Three Magnitudes relating to Manufacturing Production, classified according to Ultimate Use and adjusted for Net Exports, 1929

Ultimate Domestic Use	Value Added (*millions of dollars*)	Wages	Wage Earners (*thousands*)
Consumption goods, total [1]	18,196	6,001	4,861
Foods	4,173	990	868
Wearing apparel, etc.	5,327	2,151	1,990
Household goods	2,835	1,084	884
Private transportation	2,911	1,071	698
Publications	1,988	497	290
Other	985	211	155
Capital goods	6,603	2,993	1,996
Construction materials	3,311	1,334	1,001
Producers' supplies	3,118	1,016	788
All manufactures [1]	31,279	11,400	8,671

[1] The entries for all consumption goods and for all manufacturing are not the sums of the several items in the table, but have been computed directly by use of the ratios of Table Vc.

A final comparison shows, for selected industries, the proportion of the domestic product that finds its market in foreign countries. A part of these exports may be offset by incoming products of similar character or satisfying the same general needs. This offsetting of foreign trade movements served to reduce the influence of trade on the aggregate volume of manufacturing to the degree shown in preceding tables. Yet the influence of foreign trade on particular industries greatly exceeds these average relationships, as Table Ve shows. Advantage is here taken of the opportunity to use data in physical terms, and the problem of valuation is therefore not so pressing. We do

assume, however, that the average quality of the exported portion and that retained for domestic use is the same.

Table Ve

Percentage of Domestic Production Exported, Selected Manufactured Commodities *, 1929

(based on data expressed in physical units)

Commodity	Percentage Exported	Commodity	Percentage Exported
Rosin	60.8	Household refrigerators	9.3
Turpentine	50.6	Caustic soda	8.4
Borax	47.0	Lumber and timber products	8.3
Dried fruits	46.0	Gas oil and fuel oil	8.3
Copper, refined	36.2	Cotton cloth	7.3
Kerosene	35.4	Cigarettes	6.9
Carbon black	32.4	Iron and steel rolled products	5.7
Lubricating oil	31.4	Hosiery	4.9
Benzol	26.1	Tires	4.0
Patent side leather	25.4	Coke	2.1
Corn starch and corn flour	22.5	Sugar, refined	2.0
Motor fuel	13.8	Wrapping paper	1.4
Goat and kid upper leather	12.8	Boots and shoes	1.3
Automobiles	12.0	Cotton yarn	1.0
Wheat flour	11.4		

* See *Foreign Trade of the United States, 1933* (U.S. Department of Commerce, Trade Promotion Series No. 156) pp. 13, 14. Obviously not all major manufactured commodities are listed, for the reason that the exports of many are negligible and also that data in quantity terms are not available. The latter reason explains the omission of industrial machinery (13.3 per cent of value exported), agricultural machinery (25.1 per cent of value exported), electrical machinery (5.5 per cent of value exported), and other commodities for which there is a considerable foreign market.

The export market absorbed in 1929 a large share of the products of many manufacturing industries. Over half of the production of rosin and turpentine was exported, over a fourth of refined copper, lubricating oil, patent side leather; almost one-half of dried fruits; one-fourth of the output of canned fruit (by value); one-fourth of agricultural machinery (by value); 13 per cent of all industrial machinery (again by value); and 12 per cent of the number of automobiles. In the aggregate, however, exports are not a dominant element in the manufacturing structure and, when considered in relation to imports of manufactured goods, do not alter greatly the distribution pattern that consideration of production alone suggests.

Appendix VI

Method of estimating Capital Investment in Manufacturing Industries, 1929

The estimates of capital invested in manufacturing processes for the production of various types of consumption goods and capital equipment presented in Chapter II (Tables 2 and 4) are based upon capital assets reported by manufacturing corporations to the Bureau of Internal Revenue. A series of adjustments have been made in order to increase the comparability of these figures with Census of Manufactures data. In so doing, several rather broad assumptions have been made, which reduce the accuracy of the final estimates. It is believed, however, that despite these difficulties[1] the resulting estimates are fair approximations to the amount of capital invested in manufacturing industries in 1929.

Any definition of capital that provides usable figures for the measurement of the role of capital in manufacturing is subject to many limitations. The most serious defect in the figures drawn from corporation reports is their inadequate appraisal of the real significance of the factors they measure. Just as number of wage earners does not adequately measure the relative or absolute skill of labor, so capital values fail to reflect the vast accumulation of technical improvements that is our common heritage. Also, in relying on market values, as is in-

[1] For a discussion of the difficulties arising from the comparison of Census of Manufactures and Internal Revenue data, see the article by R. C. Epstein, 'A General-Purpose Classification for Manufacturing Industries', *Journal of the American Statistical Association*, March 1935, pp. 47–57. The difficulties arise chiefly because of differences in classification, industrial overlapping of corporation records, and the lumping of manufacturing and nonmanufacturing assets. The efforts made to combat these difficulties in preparing the present estimates will appear from the description of method in this Appendix.

evitable, care must be taken to avoid double counting. We have been led to exclude, where possible, accounts receivable from our capital figures, since in the aggregate duplication would result if they were included. Some duplication undoubtedly remains by the inclusion of investments reported in miscellaneous assets. For all corporations the inclusion of cash represents a duplication in that in large part it is a claim on other companies—banks. From the viewpoint of manufacturing alone, however, our definition of capital seems most informative.

Not all corporations report balance sheets to the Bureau of Internal Revenue, although the coverage, in terms of gross sales, is almost complete. Capital assets data for December 31, 1929, as reported for manufacturing corporations (i.e., those classed as predominantly manufacturing in character) were raised to cover all corporations of the same group on the basis of the 1931 coverage of gross sales, with a preliminary adjustment for the change in number of corporations between 1929 and 1931. In most instances the adjustment was quite minor. The same adjustment ratios were applied to all items of capital assets, divided into three groups: fixed assets (real estate, buildings, equipment less depreciation), circulating capital (cash and inventories), other capital assets (copyrights, formulas, goodwill, sinking funds, guaranty deposits, etc.). Accounts receivable have been excluded because they tend to be offset by accounts payable, and from the viewpoint of the entire manufacturing structure are not net additions to the capital stock.

The estimates of capital in manufacturing enterprises, corporate and non-corporate, were secured by multiplying the value of products reported by establishments in major industrial groups of the Census by the ratio of capital to gross sales of the corporations classed in the approximately equivalent manufacturing group. Certain combinations of classifications were necessary on the one hand; certain detailed divisions were made on the other. The major industrial groups were: foods, including tobacco, textiles and their products, leather and its manufactures, rubber products, forest products, paper and allied products, printing, publishing and allied industries, chemicals and allied products, including petroleum products, stone, clay and glass products, metal and its products, and miscellane-

ous. The value of product figures of the Census of Manufactures were first reduced by the extent of interplant transfers (as reported by the Bureau of the Census in *Sales of Manufacturing Plants, 1929*, pp. 52 ff.) since it is probable that such duplication does not appear in the corporate returns of gross sales.

The estimated capital investment in each major Census group was next allocated according to the various divisions of ultimate use as identified in Appendix I, Classification C. Since many of the industrial groups parallel that classification (e.g., foods), no great loss in accuracy results from the approximate character of the divisions. Estimates for certain groups were based on detailed figures on capital assets for the subgroups of the metal and its products group (which includes automobiles) and for the petroleum and other mineral oil refining, and the sawmill and planing mill products subgroups, secured through the courtesy of the Bureau of Internal Revenue, Division of Research and Statistics. Since these detailed figures were not available for any year prior to 1933, it was necessary to assume that there had been no disparate movements in the relative amounts of capital in the major groups covered between 1929 and 1933. Use of the fairly detailed industrial groups simplified considerably the allocation of total capital sums according to the ultimate product to which they were related. The allocations were actually made on the basis of the distribution, within each of the 20 industrial groups and subgroups of the item 'value added', as recorded, for all industries, in text Tables 2 and 3. The subdivisions of the metal and its products group used in these calculations were: (a) locomotives and railroad equipment, factory machinery, agricultural machinery and equipment, office equipment, miscellaneous machinery (all capital goods); (b) iron and steel; (c) motor vehicles; (d) electrical machinery and equipment; (e) metal building materials and supplies; (f) hardware, tools, etc; (g) precious metal products and processes; (h) other metals, products and processes; (i) household machinery and equipment.

Appendix VII

Detailed Classification of Manufactured Goods according to Ultimate Use and Durability

Appendix VII

Detailed Classification of Manufactured Goods according to Ultimate Use and Durability

In Chapter II, various items relating to the manufacture of consumption and capital goods were examined, in simplified form, with reference to the durability of the product. Here we show in detail the divisions upon which the text comparisons were based. Certain peculiarities of individual industries result in entries that deviate somewhat from the general pattern.

	Consumption Goods										
	Total	Foods	Wearing apparel, etc.	House-hold goods	Trans-porta-tion	Publica-tions	Other	Capital Goods	Construc-tion Ma-terials	Produc-ers' Supplies	All Manu-factures
						(millions of dollars)					
Value of product											
Durable	10,388	...	627	3,466	6,115	...	180	13,418	6,158	347	30,311
Semidurable	12,950	...	10,531	1,207	1,054	...	157	502	627	381	14,459
Transient	19,166	12,898	237	743	1,143	2,752	1,393	...	...	6,499	25,665
Value added by manufacture											
Durable	4,787	...	308	1,935	2,432	...	111	6,874	3,138	116	14,915
Semidurable	5,898	...	4,790	553	463	...	92	181	241	200	6,520
Transient	7,658	4,119	130	335	276	1,971	826	...	...	2,792	10,450

Cost of materials											
Durable	5,601	...	319	1,531	3,683	...	69	6,544	3,020	231	15,396
Semidurable	7,052	...	5,741	654	591	...	66	321	385	181	7,939
Transient	11,508	8,779	107	407	867	781	567	...	...	3,706	15,215
Wages											
Durable	1,881	...	120	778	932	...	51	3,126	1,304	30	6,341
Semidurable	2,386	...	1,960	215	176	...	36	72	56	84	2,598
Transient	1,782	977	32	87	58	493	134	...	...	899	2,681
Salaries											
Durable	491	...	44	235	198	...	14	798	346	7	1,641
Semidurable	601	...	484	59	45	...	13	22	33	22	678
Transient	954	328	14	41	16	416	138	...	...	322	1,276

(thousands)

Number of wage earners											
Durable	1,308	...	94	588	588	...	38	2,064	966	20	4,357
Semidurable	2,220	...	1,833	219	137	...	31	68	55	84	2,427
Transient	1,372	857	26	72	36	288	93	...	...	682	2,055
Number of salaried workers											
Durable	182	...	16	90	71	...	6	297	128	3	610
Semidurable	214	...	170	21	17	...	5	8	12	8	242
Transient	385	140	5	15	7	176	43	...	...	122	507
Horsepower (rated capacity)											
Durable	5,095	...	143	1,834	3,002	...	116	10,453	7,480	348	23,376
Semidurable	5,536	...	3,806	919	742	...	69	335	308	402	6,581
Transient	7,286	4,219	87	552	358	1,349	721	...	...	5,687	12,973

Appendix VIII

Scale of Manufacturing Operations

Various data are available in Census of Manufactures records and from other sources that indicate the scale of manufacturing operations, and a considerable literature on this subject has been published.[1] Hence it is not discussed extensively in this monograph. But the subject is not without interest in a study of the manufacturing structure, even within so restricted an area as our own. Accordingly, in this Appendix are presented certain materials bearing on the size of manufacturing establishments. Table VIIIa summarizes data relating to establishments classified according to the magnitude of the value of their products. Comparison of these ratios for 1929 with those for 1919 indicates no major changes. The industrial integration that took

Table VIIIa

Measures of the Scale of Manufacturing Operations, 1929

Value of Product per Establishment (*thousands of dollars*)	Establishments	Wage Earners (*percentage of total*)	Value of Product (*percentage of total*)	Value Added by Manufacture (*percentage of total*)
5– 19.9	32.9	2.3	1.1	1.5
20– 99.9	35.7	7.8	5.1	6.5
100– 499.9	20.9	18.9	14.2	16.2
500– 999.9	4.9	12.7	10.3	11.1
1000–2499.9	3.5	18.2	16.2	16.9
2500–4999.9	1.2	12.5	12.2	12.7
5000 and over	.9	27.6	40.9	35.1
Total	100.0	100.0	100.0	100.0

[1] See particularly W. L. Thorp, *The Integration of Industrial Operations*, published as 14th Census Monograph III. More recently have appeared *The Modern Corporation and Private Property*, A. A. Berle and Gardiner Means (Macmillan, 1933); 'Concentration of Corporate Control', by W. L. Crum, *Journal of Business*, University of Chicago, July 1935, pp. 269–83; *Big Business, Its Growth and Place* (Twentieth Century Fund, 1937).

place during these post-War years was not accompanied by any change in the size of manufacturing establishments. Rather it took the form of binding together single establishments under a system of common ownership and control. On this development the records on size of establishments throw little light.[2]

Data on size of establishments help, however, to identify industries in which large scale operations predominate. The 'mass production' industry has taken its place in our productive economy and, while perhaps not common, is dramatically typical of some of our more important industries. One requirement of this type of production is a large establishment, employing a large working force. We can roughly identify such industries by selecting those in which the majority of the wage earners work in plants employing a relatively large number of workers. While this method of selection is crude, because it ignores the possibilities of large scale operations in industries where the volume of output does not make possible the employment of a large force, this is probably not a serious defect.

The 1929 Census of Manufactures reports, by industries, the number of wage earners classified by size of establishment. Irregular class intervals are used for convenience in tabulating, but the variation in size of manufacturing plant is evident.[3] Location of the interval that marks the lower limit of half the

[2] Special compilations of the 1933 Census, furnished by the Bureau of the Census to the Twentieth Century Fund, grouped wage earners in establishments under the same ownership in 84 industries. The number of wage earners in the largest *enterprises* in each industry, expressed as a percentage of all wage earners, made possible the following comparison of degree of concentration.

In 5 industries over 90 per cent of the wage earners were employed by the largest 6 concerns: cigarettes (99.4 per cent in the largest 8, 91.4 per cent in the largest 4 concerns), typewriters, asphalted-felt-base floor covering, smelting and refining copper, sewing machines. In a sixth industry, corn sirup, over 90 per cent of its wage earners were employed by 7 concerns. Some of the other industries were: 80–90 per cent, photographic apparatus, explosives, matches, firearms, watchcases, cash registers and adding machines, rayon, motorcycles (7 concerns), beet sugar refining; 70–80 per cent, motion pictures, aircraft, motor vehicles, tires and tubes, cane sugar refining, aluminum products, pencils, tin cans, wrought pipe, agricultural implements (8 concerns), soap (8 concerns), zinc refining, steam and electric railroad cars. The least concentration in the 84 industries studied, according to this method of comparison, was in the women's clothing industry, where but 3.7 per cent of all wage earners were employed by the largest 6 concerns (*Big Business, Its Growth and Place*, pp. 41–7).

[3] Occasionally an establishment may mean more than one plant. Two or more plants in the same town or city owned by one individual or corporation, for which one set of account books is kept, are reported as a single establishment by the Census of Manufactures. As a result, the size of the industrial unit may be slightly overstated.

wage earners of each industry supplies a measure of relative industrial concentration. Each figure is roughly a weighted median of the establishment distribution. In Table VIIIb the 326 manufacturing industries are tabulated according to these median groups, as well as the number of establishments and wage earners in each size division. Entries in the last two columns are as reported by the Census, and are not derived from the industry classifications.

Table VIIIb

Size of Manufacturing Establishments, 1929

Wage Earners per Establishment (1)	Industries with at least Half their Workers in Given Group and Over (2)	Establishments at Given Ratio (*thousands*) (3)	Wage Earners in Establishments of Col. (3) (*thousands*) (4)
1–5	1	95.8	280
6–20	23	53.5	596
21–50	57	25.0	814
51–100	63	12.5	892
101–250	80	10.2	1,589
251–500	49	3.9	1,331
501–1000	29	1.7	1,177
1001–2500	16	.8	1,145
2501 or more	8	.2	1,015
Total	326	211.0*	8,839

* Includes 7.4 thousand establishments reporting no wage earners.

Many small manufacturing establishments with few workers employ in the aggregate only a small percentage of all manufacturing wage earners. On the other hand, the largest 206 establishments employed 1,015 thousand wage earners in 1929, or 11.5 per cent of the total. The smallest 95,767 establishments [4] employed only 3.2 per cent of all wage earners.

[4] The very small establishments are excluded from the Census tabulations, since only concerns with an annual product of $5,000 or more are reported. In 1919 the number of wage earners in 60,215 plants with a value of product of more than $500 but less than $5,000 was only 0.5 per cent of the number of wage earners in plants with products valued at $5,000 or more.

In one industry, cheese making, the dominant size of establishment is extremely small: over half the workers were employed in plants with no more than 5 employees. At the other extreme, in 8 industries over half the 1929 working force were employed in plants with more than 2,500 employees: cash registers and business machines, locomotives, motor vehicles, phonographs, rayon, mechanical refrigerators, rubber tires and tubes, and watches and watch movements. The median size of plant for most industries (80) falls in the group employing 101–250 employees.

Table VIIIc

Relation of Size of Plant and Proportions of Value Added distributed as Wages, 1929

Manufacturing Industries (entries are number of industries)

Wages as a Percentage of Value Added	Median Number of Employees per Establishment: 1 to 5	6 to 20	21 to 50	51 to 100	101 to 250	251 to 500	501 to 1000	1001 to 2500	2501 or more	Total
0– 4.9	..	..	..	..	..	..	..	..	..	..
5.0– 9.9	..	..	..	..	..	2	..	..	..	3
10.0–14.9	..	2	1	..	..	..	3	..	..	15
15.0–19.9	..	1	6	3	1	..	2	..	..	21
20.0–24.9	..	3	9	3	3	3	..	..	1	22
25.0–29.9	1	3	3	9	4	2	..	..	2	41
30.0–34.9	..	4	3	8	12	8	4	..	2	38
35.0–39.9	..	3	7	8	10	2	3	3	1	64
40.0–44.9	..	3	7	9	24	13	3	3	2	55
45.0–49.9	..	2	8	11	13	8	6	6	..	33
50.0–54.9	..	1	4	3	4	2	1	1	..	22
55.0–59.9	..	..	2	1	2	1	..	..	1	7
60.0–64.9	..	1	..	..	..	..	2	..	..	3
65.0–69.9	..	..	..	..	..	..	..	..	..	..
70.0–74.9	..	..	..	..	..	..	..	..	..	..
75.0–79.9	..	..	..	..	..	..	..	..	..	..
80.0–84.9	..	..	..	..	..	1	1	..	..	2
85.0–89.9	..	..	..	..	..					
Total no. of industries	1	23	57	63	80	49	29	16	8	326
Median percentage of value added	27	34	35	35	37	38	40	42	35	37

It is an interesting possibility that variations in the ratio of

Table VIIId

Twenty-four Manufacturing Industries with Large Scale Operations, 1929

(one-half the industry's wage earners employed in plants with over 1,000 wage earners)

	Wage Earners in Industry	Wage Earners in Plants with over 1000 Wage Earners (*per cent of total*)	Average Number of Wage Earners per Establishment, Entire Industry
Agricultural implements	41,663	53.5	142
Aluminum manufactures	21,210	50.5	141
Ammunition and related products	7,223	60.3*	344
Billiard and pool tables	1,390	70.6*	35
Boots and shoes, rubber	25,659	84.4	1,166
Carpets and rugs, wool	32,623	60.1	487
Cash registers and adding, calculating, and card-tabulating machines	16,840	64.3*	366
Clocks, clock movements, etc.	10,401	55.1	186
Collars, men's	2,952	51.8*	197
Electrical machinery, apparatus, and supplies	328,722	57.4	182
Engines, turbines, tractors, water wheels	61,148	60.4	307
Iron and steel: steel works and rolling mills	394,574	70.8	812
Locomotives	11,045	85.7	690
Motor vehicle bodies and parts	221,332	65.7	192
Motor vehicles	226,116	83.9	927
Optical goods	9,701	57.0	83
Phonographs	14,416	66.3*	244
Photographic apparatus and materials	12,967	63.0*	113
Rayon and allied products	39,106	86.3	1,348
Refrigerators, mechanical	16,883	91.1	497
Rubber tires and inner tubes	83,263	82.0	915
Sewing machines and attachments	10,467	63.1*	268
Typewriters and parts	16,945	66.5*	652
Watches and watch movements	10,738	90.7	1,342
Total	1,617,384		

* In reporting the number of wage earners by size groups, the Bureau of the Census frequently combines the figures of adjoining size groups in order to avoid disclosing data for individual establishments. The percentages to which this note is appended are based on estimates for industries affected by this rule, and are therefore not exact measurements. The estimate rests on the assumption that the average number of wage earners, per establishment, in the lower size groups was the same as the mid-value of the group.

wage payments to total value added may in some way be related to variations in size of plant. Wage payments by size of plant are not available, but Table VIIIb classifies industries by size of plant, and Table VIIIc compares the wage payments ratios of Table 19 with the size of gradations of industries. From Table VIIIc it is clear that there is considerable scatter in the ratio of wage payments to value added for both small and large scale industries, and some drift to higher ratios appears as we pass to industries where large scale operations are more common. The median ratios for the lower size groups are in general somewhat below those of the larger scale units but, in view of the wide variation about these medians, there is no strong evidence that a size relationship holds in the ratio of wages to value added.

If, to the 8 industries in which over half their wage earners were employed in plants with more than 2,500 workers, we add the 16 industries included when the limit is lowered to 1,000 wage earners per plant, 24 industries are characterized by large scale operations (Table VIIId).[5] The majority of these large scale industries make consumption goods. Six of the 24 can be termed capital producing: iron and steel, electrical machinery, engines and turbines, agricultural implements, cash registers, etc., locomotives. Certain of these industries, particularly steel works, are operated on a large scale because of their physical requirements; this is probably true also of locomotives. But for most of the industries the operation of such large plants is related to mass production methods, and in almost every instance the good produced is one that can be made in great quantities from standardized parts. This characteristic of modern production is plainly evident.

It is notable also that with few exceptions these products of large scale operation are durable goods. Absent are the perishable products in whose processing little effort need be expended and for which concentration of activity into large plants would be inefficient. Also absent are products in which taste and style play an important role; the scale of operation we have

[5] In that the Census industry classifications are sometimes quite broad, it may happen that an activity marked by high plant concentration is merged with one where plant size is low. The combination, therefore, may not appear in our list of industries with large scale operations.

described requires strict adherence to the production of standardized products.

An examination of the Census records for 1919 reveals that in 28 industries more than half the wage earners work in establishments with over 1,000 workers. Seven industries on the 1929 list do not appear in 1919: agricultural implements, aluminum manufactures, clocks and clock movements, engines, turbines, etc., optical goods, rayon, and mechanical refrigerators. Eleven industries lost their ranking and were, in 1929, no longer in the large scale group: steam railroad cars, emery wheels, firearms, pencils, petroleum refining, saws, wood screws, shipbuilding, slaughtering and meat packing, steam fittings and steam and hot water heating apparatus, and sugar refining. Since some of the 7 industries classed as having large scale operating units in 1929 but not in 1919 are new industries with new markets, there seems to be clear evidence of no tendency to concentration of manufacturing activities in very large plants during this post-War period. This conclusion is supported by the absolute decline between 1919 and 1929 in the number of workers in establishments employing over 1,000 men (2,398 thousand in 1919 to 2,160 thousand in 1929). But the decline is not pronounced, and the more important industries classed as large scale in 1929 were equally so in 1919. Where the causes of the concentration lie deep, where monopoly or heavy investment thrust off threatened competition, and where economies of mass production continue, then this aspect of the structure of manufacturing production changes but slowly.[6]

[6] These conclusions agree with findings of W. L. Thorp, in The Changing Structure of Industry, Part 3 of Ch. II, *Recent Economic Changes* (National Bureau of Economic Research, 1929), pp. 167–75. Arranging 321 industrial groups in order of average number of wage earners per establishment, he finds a high degree of persistence in rank. Coefficients of rank correlation are: 1914–19, +.946; 1919–21, +.975; 1921–23, +.980; 1923–25, +.986. If the 321 industries were in identical rank in successive years the coefficient would be + 1.0.

Our basis is less satisfactory for time comparisons, since the point of reference is a fixed number of employees per plant, 1,000. Nevertheless, in 1914, when output was well below that of 1929, in 18 industries more than half the employees were working in plants with over 1,000 men, and 13 of these appear in the 1929 listing of 23 (counting motor vehicles as one industry). In 7 of these 13 industries the percentage of total employment in the large plants was greater in 1914 than in 1929. The 18 industries, with the percentages of total employment in plants of over 1,000 wage earners, are:

SCALE OF OPERATIONS

Table VIIIe

Average Value of Product and Value Added per Manufacturing Establishment, by Industries, 1929

Dollars per Establishment (*thousands*)	Number of Industries[1] classified by Value of Product: Total	Value of Product: Consumption Goods	Value of Product: Capital Goods	Number of Industries[1] classified by Value Added by Manufacture: Total	Value Added by Manufacture: Consumption Goods	Value Added by Manufacture: Capital Goods	Value Added by Manufacture: Largest 40 Industries
0.0– 99.9	50	39½	10½	115	96½	18½	9
100.0– 199.9	61	50	11	75	59	16	6
200.0– 299.9	46	38	8	37	26	11	5
300.0– 399.9	35	25	10	26	18	8	4
400.0– 499.9	15	13	2	17	15	2	3
500.0– 599.9	17	12	5	4	3	1	2
600.0– 699.9	15	14	1	13	11	2	2
700.0– 799.9	11	6	5	6	4½	1½	3
800.0– 899.9	7	5	2	3	3	..	..
900.0– 999.9	6	3	3	3	2	1	1
1000.0–1099.9	6	6	..	5	3	2	..
1100.0–1199.9	8	7	1	1	1	..	..
1200.0–1299.9	5	4½	½	2	1	1	1
1300.0–1399.9	3	3	..	1	1	..	..
1400.0–1499.9	2	2	..	2	..	2	..
1500.0–1999.9	6	5	1	4	2	2	1
2000.0–2499.9	9	4	5	2	..	2	..
2500.0–2999.9	6	5	1	3	2	1	1
3000.0–3499.9	..	..	..	3	2	1	1
3500.0–3999.9	2	1	1	1	1	..	..
4000.0–4499.9	2	2	..	2	2	..	..
4500.0–4999.9	3	3	..	..	..	..	..
Over 5,000.0[2]	11	6	5	1	1	..	1
Median (thousands of dollars per establishment)	317	299	365	164	152	214	300

[1] Lumber products and electrical machinery have been placed in both capital and consumption goods groups with half weight.

[2] The 11 industries with an average establishment value of product over $5 million are (sales given in thousands of dollars):

Rayon	5,157	Linoleum	8,179
Locomotives	5,241	Rubber tires and tubes	8,463
Petroleum refining	6,768	Smelting and refining, lead	12,217
Steel works and rolling mills	6,925	Motor vehicles	15,257
Iron and steel, blast furnaces	7,347	Sugar refining, cane	24,161
		Smelting and refining, copper	38,261

The one industry with value added per establishment over $5 million is motor vehicles ($5,415 thousand). The averages for other industries are given in Appendix II.

Table VIIIf

Average Wages and Cost of Materials per Manufacturing Establishment, by Industries, 1929

Dollars per Establishment (*thousands*) (1)	Number of Industries [1] classified by Wages Paid: Total (2)	Consumption goods (3)	Capital goods (4)	Number of Industries [1] classified by Material Costs: Total (5)	Consumption goods (6)	Capital goods (7)	Number of Wage Earners in Industries of Col. (2)–(4) (*thousands*): Total (8)	Consumption goods (9)	Capital goods (10)
0– 9.9	14	12	2	9	8	1	106	99	7
10–19.9	51	42	9	11	8	3	513	492	21
20–29.9	47	42	5	19	14	5	840	807	33
30–39.9	28	20½	7½	19	14½	4½	814	597	217
40–49.9	22	16	6	14	13	1	354	313	41
50–59.9	20	16	4	8	6	2	397	315	82
60–69.9	9	9	..	13	12	1	335	335	..
70–79.9	14	10	4	11	9	2	115	68	47
80–89.9	10	7	3	6	4	2	592	117	475
90–99.9	3	2	1	12	7	5	215	136	79
100 and over	108	77½	30½	204	158½	45½	4558	3027	1531
0–99	218	176½	41½	122	95½	26½	4281	3279	1002
100–199	60	47	13	74	58	16	1498	1273	225
200–299	17	13½	3½	37	28	9	1090	803	287
300–399	11	7	4	18	15	3	895	490	405
400–499	5	1	4	12	9	3	155	7	148
500–599	2	1	1	7	4½	2½	44	32	12
600–699	1	..	1	10	10	..	17	..	17
700–799	1	1	..	8	6	2	17	17	..
800–899	2	1	1	5	5	..	31	14	17
900–999	1	..	1	1	1	..	15	..	15
1000 and over	8	6	2	32	22	10	796	391	405

0–999	318	248	70	294	232	62	8043	5916	2128
1000–1999	8	6	2	16	12	4	796	391	405
2000–2999	..	..	..	4	3	1	..	..	..
3000–3999	..	..	..	5	3	2	..	..	..
4000–4999	..	..	..	1	1	..	..	..	..
5000 and over [2]	..	..	..	6	3	3	..	..	..
Total industries	326	254	72	326	254	72	8839	6306	2533
Median (thousands of dollars per establishment)	50.5	46.6	72.5	155.4	154.3	159.4			

[1] See Table VIIIe.

[2] The 6 industries with material costs of more than $5 million per establishment are: petroleum refining, $5,209; iron and steel, blast furnaces, $5,812; motor vehicles, $9,842; smelting and refining, lead, $10,733; sugar refining, cane, $20,876; smelting and refining, copper, $35,398. The 8 industries in which wage payments averaged over $1 million for each establishment are, in order of magnitude of the average: watches, rayon, motor vehicles, steel works and rolling mills, tires and tubes, rubber boots and shoes, linoleum and locomotives—all industries we have already identified with large scale operations. The figures for each industry are given in Ap. II.

The preceding analysis has been based on measures of the dominant size characteristics of manufacturing industries. Frequently, as Table VIIId indicates, the over-all averages are somewhat at variance with the measures we have given. Accordingly, summaries of the per establishment figures of Appendix II are presented in Tables VIIIe and f.

(*Footnote 6 concluded*)

Concentration greater in 1914 than in 1929	Concentration less in 1914 than in 1929
Ammunition (70.3).*	Automobiles (63.8).
Carpets and rugs, other than rag (60.2).	Boots and shoes, rubber (56.3).
Cash registers and calculating machines (77.3).	Steel works and rolling mills (53.6).
	Locomotives (79.0).
Collars and cuffs, men's (53.4).*	Typewriters and supplies (53.5).*
Phonographs (88.7).*	Watches (68.3).
Photographic materials (80.7).*	
Sewing machines and attachments (67.6).*	

* See footnote to Table VIIId.

Also included in the 1914 list are cars, steam railroads, not including operations of railroad companies (63.8), jute goods (58.2), wood screws (72.7), shipbuilding (63.6), tobacco, chewing and smoking, and snuff (54.8). The 10 industries in the 1929 but not in the 1914 list can be found by comparing this list with Table VIIId.

The lower limit used in reporting manufacturing activities in 1914 (a value of product over $500 instead of over $5,000 as in 1929) affects these comparisons somewhat, serving to cause a relative understatement of the concentration of employment. In all industries, however, only 1.8 per cent, or 130 thousand wage earners, were employed in plants reporting less than $5,000 value of product and which therefore should be excluded in order to make a proper comparison with the 1929 figures.

Appendix IX

Data on Capital Investment reported in the Massachusetts Census of Manufactures, 1928

The schedules used in compiling the 1928 Massachusetts Census of Manufactures called for the amount of capital invested under the following categories: (a) land, buildings, and fixtures; (b) machinery and tools; (c) inventories; (d) cash, accounts receivable, and sundries. The published 1928 report gave figures on total capital, but the data for the subgroups were not tabulated in 1928 or in any other year in which the capital inquiry was made (i.e., even-numbered years). The following excerpt from the 1928 schedule indicates the scope of the inquiry:

"*Capital invested: Amount of capital invested—owned and borrowed.* The answer [to the inquiry] should show the total amount of capital, both owned and borrowed, on the last day of the business year reported. All the items of fixed and live capital may be taken at the amounts carried on the books. If land or buildings are rented, that fact should be so stated and no value given. If a part of the land or buildings is owned, the remainder being rented, that fact should be so stated and only the value of the owned property given. Do not include securities and loans representing investments in other enterprises."

Since the schedules used in the 1928 Census are filed first, according to region, and second, by industry, the simplest procedure in getting the desired information on subgroups was to have the capital items transcribed on cards and the cards then sorted by industries. The data were tabulated by classifying each item, by industries, according to appropriate size divisions

and finally calculating totals from the resulting frequency distributions. This procedure resulted in some slight loss in accuracy over direct totals, but there was a gain in the time required for the tabulations and in the added information to be derived from the frequency distributions of establishments.

In considering the Massachusetts data, attention must be given the variation in the industrial composition of manufacturing in Massachusetts and in the United States as a whole. The extent of this variation is indicated in Table IXa. The data are drawn from the 1929 federal Census of Manufactures.

Table IXa

Value Added by Major Manufacturing Industries

Massachusetts and the United States, 1929

Industry	Value Added by Manufacture, Massachusetts		Percentage of all Industries	
	Millions of dollars	Percentage of national total	Massachusetts	United States
Electrical machinery	120.5	9.1	7.0	4.2
Boots and shoes other than rubber	117.6	26.1	6.9	1.4
Cotton goods	108.2	17.3	6.3	2.0
Woolen and worsted goods	96.9	29.9	5.7	1.0
Foundry and machine shops	78.1	4.5	4.6	5.5
Printing and publishing				
Newspaper and periodical	56.3	4.2	3.3	4.2
Book and job	47.3	6.4	2.8	2.3
Paper and woodpulp	44.3	11.3	2.6	1.2
Bread	40.6	5.1	2.4	2.5
Dyeing and finishing textiles	40.1	17.4	2.3	0.7
Rubber goods (other than boots and shoes) incl. rubber tires and tubes	31.8	6.8	1.9	1.5
Cutlery	29.9	46.8	1.7	0.2
Textile machinery	28.7	33.4	1.7	0.3
Leather	28.1	19.6	1.6	0.5
Boots and shoes, rubber	25.1	36.9	1.5	0.2
Total, 15 industries	893.5	10.1	52.3	27.7
All manufactures	1710.7	5.4	100.0	100.0

Table IXb presents for various detailed groups of industries the division of total capital investment for Massachusetts. The estimates have been adjusted, as were the figures in Chapter III,

Table IXb

Capital Investment and Number of Wage Earners, 1928

Groups of Manufacturing Industries, Massachusetts

Stage of Manufacture and Ultimate Use of Product	Establishments [1]	Wage Earners	Machinery and Tools per Wage Earner (*thousands of dollars*)	Total Capital (*millions of dollars*)	Percentage of Total Capital			
					Land, buildings, and fixtures [2]	Machinery and tools	Inventory	Cash, accounts receivable, and sundries
Finished goods, total	7,202	327,198	897	1,622.4	27.8	18.1	24.7	29.4
Consumption goods	5,068	229,447	757	1,048.7	27.9	16.6	24.4	31.1
Durable	849	54,052	784	280.6	20.2	15.1	27.5	37.2
Semidurable	1,644	126,895	413	377.6	21.5	13.9	29.7	34.9
Transient, foods	2,007	28,755	1,021	174.5	38.5	16.8	20.6	24.1
Transient, other	568	19,745	2,510	216.0	40.3	22.9	14.4	22.4
Capital goods	1,111	67,669	1,339	424.9	27.5	21.3	25.1	26.1
Construction goods	791	17,645	951	94.6	27.4	17.8	24.3	30.5
Producers' supplies	232	12,437	986	54.2	30.2	22.6	27.3	19.9
Unfinished goods, total	2,704	213,729	1,570	1,330.4	30.2	25.3	22.3	22.2
Consumption goods	1,593	172,574	1,435	912.9	24.3	27.1	26.4	22.2
Durable	354	12,413	902	55.7	31.9	20.1	24.1	23.9
Semidurable	1,056	153,947	1,498	832.4	23.6	27.7	26.7	22.0
Transient	183	6,214	918	24.9	30.7	23.0	21.8	24.5
Capital goods	263	13,719	1,400	68.9	42.3	27.9	18.2	11.6
Construction goods	28	197	1,112	1.9	38.0	11.7	18.7	31.6
Producers' supplies	820	27,239	2,516	346.8	43.4	19.7	12.4	24.5
All industries	9,906	540,927	1,162	2,952.8	28.9	21.3	23.6	26.2

[1] The published total is 9,971 establishments.

[2] Includes an estimate of the value of rented property.

Table IXc

Capital Investment and Number of Wage Earners, 1928

15 Selected Manufacturing Industries, Massachusetts

(industries are arranged in order of magnitude of value added)

Industry	Wage Earners	Machinery and Tools per Wage Earner (*thousands of dollars*)	Total Capital (*millions of dollars*)	Percentage of Total Capital			
				Land, buildings, and fixtures	Machinery and tools	Inventory	Cash, accounts receivable, and sundries
Electrical machinery	24,788	564	90.9	22.8	15.4	41.1	20.7
Boots and shoes, other than rubber	55,478	153 *	105.7	15.1	8.0	31.1	45.8
Cotton goods	65,192	1,910	350.8	27.8	35.5	20.6	16.1
Woolen and worsted goods	45,248	1,566	260.5	21.2	27.2	29.5	22.1
Foundry and machine shops	19,803	998	109.3	24.9	18.1	26.7	30.3
Printing and publishing							
Newspaper and periodical	14,634	1,497	41.7	38.3	20.2	4.3	37.2
Book and job			46.9	20.8	28.7	19.6	30.9
Paper and wood pulp	12,602	2,086	115.3	31.9	22.8	15.6	29.7
Bread	8,770	891	31.9	52.1	24.5	10.8	12.6
Dyeing and finishing textiles	13,629	1,345	76.8	21.1	23.9	23.3	31.7
Rubber goods (except boots and shoes) incl. rubber tires and tubes	10,552	1,180	59.9	22.4	20.8	24.6	32.2
Cutlery	3,327	1,725	58.3	12.1	9.8	11.7	66.4
Textile machinery	10,399	1,474	79.5	18.0	19.3	14.0	48.7
Leather	10,975	336 *	53.5	23.1	6.9	39.9	30.1
Boots and shoes, rubber	12,709	721	47.5	20.6	19.3	29.0	31.1

* Undoubtedly an underestimate because of the prevalence of rented machinery.

to allow for establishments not reporting rented capital or not reporting fully on the subgroups of total capital.[1]

In Table IXc appear detailed measures for the 15 major industries of Massachusetts (cf. Table IXa). The basic figures have been adjusted to compensate for incomplete reporting.

Table IXd presents unweighted frequency distributions of individual establishments for certain of the major divisions.

[1] The method of adjustment was: (1) allocate to the four subgroups any figures on total capital for which data on type of capital were not reported; (2) estimate the value of rented real estate on the basis of the ratio of the value of land and buildings to total capital for those establishments reporting owned land and buildings. The adjustments were made first for the 15 industries of Table IXa, then for the groups of Table IXb less the 15 industries, and totals obtained by combining the two sets of estimates. No allowance could be made for the value of rented machinery, which in certain industries, notably boots and shoes, comprises a large part of the total capital investment.

Table IXd

Percentage Distribution of Number of Manufacturing Establishments

Items of Capital Investment [1]

Thousands of Dollars	All Manufactures	Consumption Goods	Capital Goods	Durable Goods	Electrical Machinery	Boots and Shoes, other than Rubber [2]	Cotton Goods	Foundry and Machine Shops
Total Capital								
0.1– 20.0	30	33	22	23	16	11	3	14
20.1– 40.0	13	12	15	16	4	11	1	17
40.1– 60.0	8	8	6	9	6	6	1	8
60.1– 80.0	5	4	6	7	3	6	2	7
80.1– 100.0	4	4	5	6	5	5	..	7
100.1– 200.0	12	12	14	15	16	20	3	16
200.1– 300.0	6	5	8	6	7	10	7	10
300.1– 400.0	4	4	5	5	9	6	6	6
400.1– 500.0	3	3	3	2	4	5	4	3
500.1–1000.0	6	6	6	5	15	10	11	6
1000.1–2000.0	4	4	4	3	4	5	19	3
2000.1–3000.0	2	2	3	1	4	2	15	1
3000.1–4000.0	1	1	1	1	3	1	9	..
4000.1–5000.0	1	1	1	..	..	1	6	1
Over 5000.0	1	1	1	1	4	1	13	1
Total	100	100	100	100	100	100	100	100

Thousands of Dollars	All Manufactures	Consumption Goods	Capital Goods	Durable Goods	Electrical Machinery	Boots and Shoes, other than Rubber [2]	Cotton Goods	Foundry and Machine Shops
Land, Buildings, and Fixtures (unadjusted for rented property)								
0.1– 10.0	47	49	39	43	29	47	5	34
10.1– 20.0	12	11	13	14	13	11	3	13
20.1– 30.0	7	6	8	8	4	6	3	10
30.1– 40.0	5	5	5	6	4	7	3	5
40.1– 50.0	3	3	4	4	6	5	1	5
50.1– 100.0	10	10	11	10	9	13	13	14
100.1– 500.0	12	12	15	12	26	9	33	16
500.1–1000.0	2	2	3	2	4	1	18	2
1000.1–1500.0	1	1	1	..	..	1	8	1
1500.1–2000.0	..	..	..	..	2	..	4	..
Over 2000.0	1	1	1	1	3	..	9	..
Total	100	100	100	100	100	100	100	100
Inventory								
0	4	4	4	4	1	2	..	2
0.1– 10.0	47	48	41	42	20	20	5	43
10.1– 20.0	11	10	10	14	6	13	4	12
20.1– 30.0	6	5	7	7	9	8	4	9
30.1– 40.0	4	3	5	5	9	8	2	5
40.1– 50.0	3	3	3	4	6	6	2	3
50.1– 100.0	9	9	12	10	13	13	12	12
100.1– 500.0	12	13	12	11	25	24	35	12
500.1–1000.0	2	3	3	2	6	4	22	1
1000.1–1500.0	1	1	1	1	..	..	7	..
1500.1–2000.0	..	..	1	..	1	1	4	1
Over 2000.0	1	1	1	..	4	1	3	..
Total	100	100	100	100	100	100	100	100
Cash, Accounts Receivable, and Sundries								
0	7	8	6	5	2	1	2	2
0.1– 10.0	41	42	38	38	23	18	5	34
10.1– 20.0	11	10	11	13	6	10	5	13
20.1– 30.0	7	7	9	9	6	6	5	9
30.1– 40.0	5	4	6	7	10	5	4	7
40.1– 50.0	3	3	3	3	3	5	5	4
50.1– 100.0	9	9	12	10	16	14	13	14
100.1– 500.0	13	13	11	11	26	34	41	13

Thousands of Dollars	All Manufactures	Consumption Goods	Capital Goods	Durable Goods	Electrical Machinery	Boots and Shoes, other than Rubber [2]	Cotton Goods	Foundry and Machine Shops
500.1–1000.0	2	2	2	2	4	4	8	3
1000.1–1500.0	1	1	1	1	3	1	7	1
1500.1–2000.0	..	..	1	..	..	1	1	..
Over 2000.0	1	1	..	1	1	1	4	..
Total	100	100	100	100	100	100	100	100
Machinery and Tools								
0	5	6	3	4	2	6	14	3
0.1– 10.0	51	53	44	50	28	46	4	41
10.1– 20.0	11	10	13	14	14	18	..	15
20.1– 30.0	7	7	8	8	4	13	6	7
30.1– 40.0	4	4	6	5	10	6	3	10
40.1– 50.0	3	2	4	3	2	3	1	5
50.1– 100.0	7	6	8	7	19	4	3	8
100.1– 500.0	8	8	11	7	15	4	24	9
500.1–1000.0	2	1	2	2	3	..	12	1
1000.1–1500.0	1	1	1	..	1	..	19	1
1500.1–2000.0	..	1	..	..	1	..	4	..
Over 2000.0	1	1	..	..	1	..	10	..
Total	100	100	100	100	100	100	100	100
Machinery and Tools per Wage Earner								
0 – .050	9	11	5	6	1	20	14	5
.051– 1.050	60	62	60	65	71	79	25	62
1.051– 5.050	28	24	33	27	25	1	52	31
5.051–10.050	2	2	2	2	3	..	7	2
Over 10.050	1	1	1	..	..	..	2	..
Total	100	100	100	100	100	100	100	100
Total no. of establishments	5295	3448	810	2067	69	186	113	296

[1] The extreme range in the values shown has dictated the use of irregular class intervals. Breaks in the class intervals are indicated by additional spacing. The entries in the table are not individual establishments, but percentages of the total number of establishments given at the foot of the table.

[2] The estimate of value of machinery for the boot and shoe industry is low because the value of rented property was not reported.

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